## handbook for Architects 30 Builders

PUBLISHED UNDER THE AUSPICES OF THE

Chicago Architects' Business Association Vol. XV. 1912.

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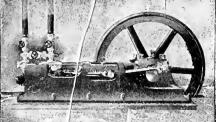
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### HANDBOOK

For

## Architects and Builders

Published under the auspices

of the

Chicago Architects' Business Association

1912 FIFTEENTH YEAR

EMERY STANFORD HALL, Editor Copyright, 1912, By H. L. PALMER

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Net area in sq. in Weight per ft. in lbs	.11	. 19	. 25	.30	. 44	. 60	.78	. 99	1.22
Weight per ft. in 1bs	. 38	66	. 86	1.05	1.52	2.06	2 69	3.41	4.21
Extrasincts, per 100 lbs	25	. 10	. 10	. 05		В			

#### Standard Sizes Corrugated Squares

Size in Inches									
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## Preface

The fifteenth Edition of the Handbook for Architects and Builders is before you. No radical changes have been made from former editions and the plan and arrangement is similar. All the matter has been revised and corrected up to date and much new material has been added. The Building Ordinances and all the amendments have been published in italics up to the time of the adjournment of the City Council. There also appears at the end of the Ordinance several Special Ordinances which have to do with the erection and location of buildings which have no special section number. Special attention has been given to the revision of the Index to the Building Ordinances. Attention is called to the new Fire limits and the Map thereof on Page 157.

We welcome Captain Robert W. Hunt as a contributor to the pages of the Handbook of an article on "Testing Materials," which has been prepared after much research. Readers will find it both interesting and instructive. Mr. Fred J. Postel takes over the editing of the Heating and Ventilating work as well as Electric Wiring. Mr. S. F. Joor will furnish an article on Conveying Machinery.

The Handbook today covers an exclusive field and is recognized as a reference book by Architects, Contractors and Builders. It is arranged so that the information can easily be found. Great care has been taken to check up all the rules, tables and examples so as to avoid errors.

The demand for the Handbook is constantly increasing and it has become almost indispensable to the Architects and those connected with the Building Trades.

Our Classified List furnishes the Architect with a list of those engaged in the Building Material and Contracting business and we have exercised our best judgment as to those represented in our Book. We urge Architects desiring the names of Contractors and Material firms to use this list.

H. B. Whulock

Arthur Woltersdorf

George Beaumont

F.M. Weber

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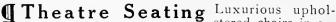
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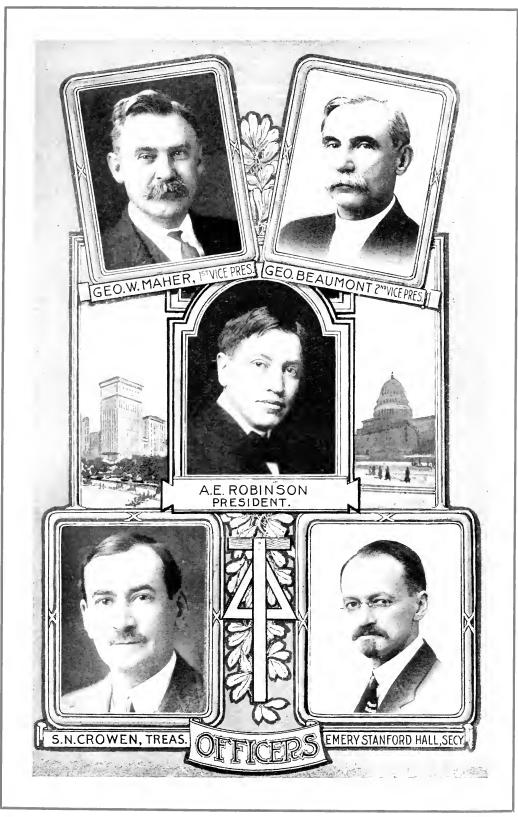
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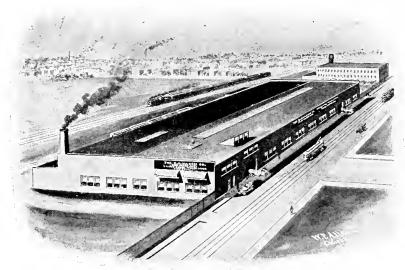
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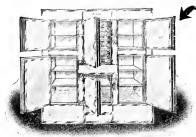


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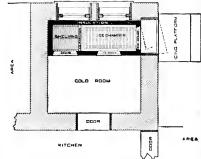
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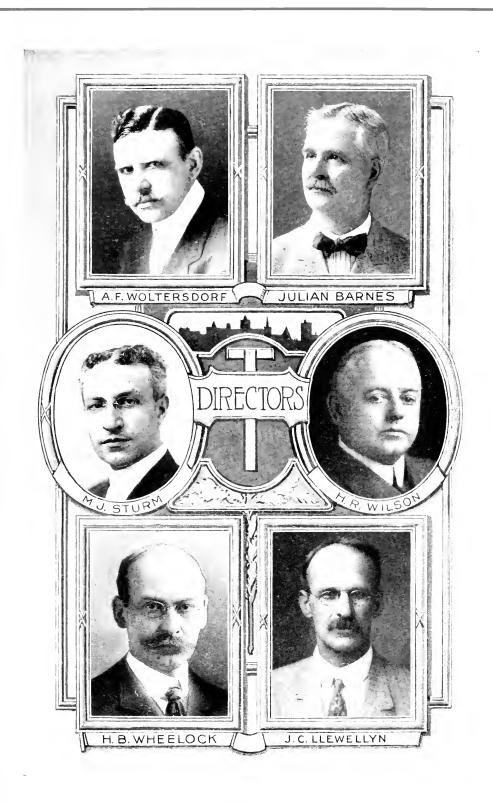
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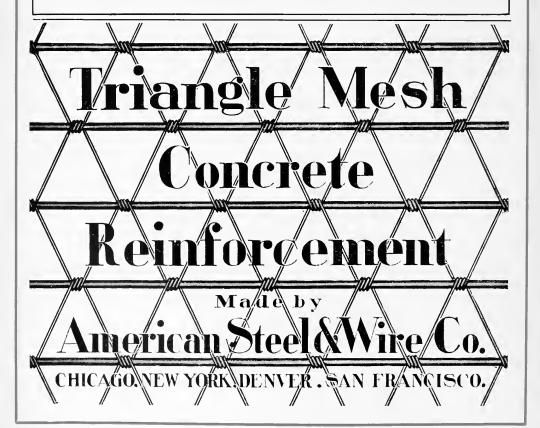
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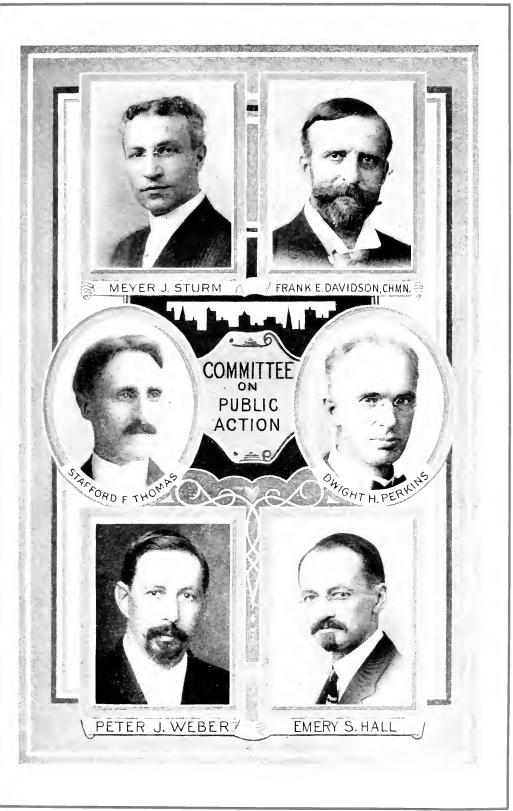
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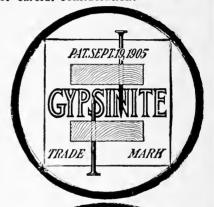
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### Chicago Architects' Business Association

Organized January 12, 1897. Incorporated June 25, 1897.

Editorial.

The past year has been one of prosperity or the Chicago Architects' Business Associafor the Chicago Architects Business Associa-tion. The programs of the Association have been unusually interesting. In September, the Association was addressed by Mr. Prid-more on "The Theatres, Ancient and Modern." In October, Mr. Gates and Mr. Wagner each addressed the meeting on "Terra Cotta. each addressed the meeting on "Terra Cotta. especially Polychromatic colors for attractive use in construction of terra cotta." The November meeting, which was very largely attended, was devoted to a discussion of the "Health Problem"; the Association being addressed by members of the Chicago Tuberculosis Institute, including Dr. Henry B. Farill, Dr. Theodore B. Sachs, Dr. Ochsner, Dr. Carey and Dr. Edward Pynchon, and by Architects Meyer J. Sturm, Richard E. Schmidt, W. A. Otis and Alexander Levy. Mr. Ball, Deputy Health Commissioner, also addressed the meeting. The discussion of these gentlemen forming a very substantial these gentlemen forming a very substantial contribution to the knowledge of the bers of the Association on the tec Association on the technical bers of the Association on the tech side of health problems. At this me-the following resolutions were passed: At this meeting

"Whereas, good health is the greatest asset to the people of this community. Be It Resolved, that it is the duty of the City Government to take every prethe City Government to take every pre-caution and extend such protection as will promote the general health. To this end, we urge that an additional bureau be added to the Health Depart-ment to be known as the 'Ventilation Bureau,' in which experts shall be em-ployed: First, for the purpose of pass-ing upon all new buildings to be con-structed; and, second, for the purpose of investigating and improvement of old investigating and improvement of operation of ventilating plants.

"Be It Resolved, that it is the desire of the Chicago Architects' Business Association that the architects of the city be represented at the Voluntary Commission on Ventilation, now making a scientific study of that subject.

As a result of this resolution, Mr. Meyer As a result of this resolution, Air. Meyer J. Sturm was appointed to represent the Association on this Commission and is now participating in the work of the Commission. He reports that the work of this body up to the present time indicates that the investi-gations of this Commission will add greatly to the fund of accurate, scientific knowledge of ventilation problems. Too much emphasis cannot be laid upon the importance of a more thorough and comprehensive, scientific study of the ventilating problem. There seems to of the ventilating problem. There seems to be almost no difference of opinion as to the necessity of thorough and complete ventilation, but there seems to be a lamentable lack of really authentic information as to how of really authentic information as to this can be economically accomplished. cent investigations seeming to have exploded as impractical theories, which have been generally accepted as fundamental.

In February, the Association made an excursion to inspect the new Northwestern Station and after the excursion, Mr. Chas. S. Frost, architect of the station, addressed the Association, giving a very interesting de-scription of the stations of the Northwestern Railroad, from its beginning up to the present time, describing the problems that were to be met and how they were met in the

new station.

In March, Mr. Culbertson, editor of the "Economist," addressed the Association on "Economist," addressed the Association on the subject. "A Journalists' Three Decades of Contact with the Chicago Architects and Real Estate Interests and some Deductions. Mr. Culbertson's paper was particularly enjoyed by the members of the Association. On account of Mr. Culbertson's intimate, personal acquaintance with practically all of the architects practicing in Chicago, he was able to give many little personal reminiscences of the well known characters in the overhive turn! professions

architectural profession.

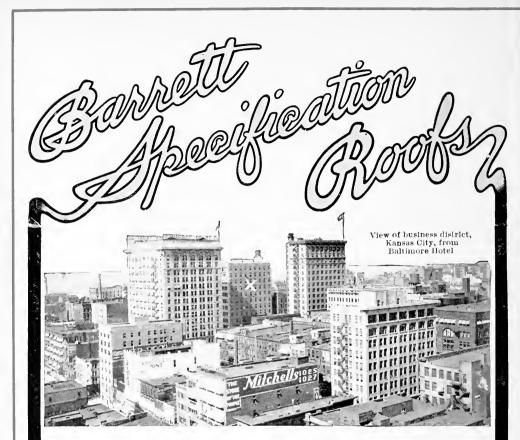
In April, William E. Blodgett, of Boston, addressed the Association on the "Gustavano System of Cohesive Construction." Mr. Blodgett showed rare skill in instructing and entertaining the members regarding the Gustavano System of Arch Construction, which. Because of its possibilities in architectural design, proved particularly attractive to

architects.

The May meeting of the Association was devoted to improvement of the rear of premises in residence districts, and the Associaises in residence districts, and the Association listened to an address by Mr. J. H. Prost, City Forester, Making a plea for saving trees; by Mr. H. B. Swoje, Superintendent of Graceland Cemetery, on "The beautifying of back yards," Mrs. John Worthy spoke on the Out Door Art League and Mrs. Grower on "Eack Yards and School Yards," Mr. Arthur Woltersdorf, the worthy chairman of our Entertainment Committee, discovered, as a result of this meeting, that he was not alone in his championship of a alone in his championship of was not movement for more artistic and treatment of back yards and rear elevations. The City of Chicago, thus far, has

failed to realize the splendid possibilities for improving the spirit and character of her people by giving more attention to artistic people by giving more according to according to the environment. The lots in the city are deep, leaving, in the aggregate, vast acreas of ground uncovered by buildings, which should be converted into beautiful, secluded gardens. There, at the close of his day of enervating toil, the weary wage earner that and refreshment 'midst elemight find rest and refreshment midst elevating and ennobling surroundings. We have the ground, the seed may be obtained for a pittance; the people have a desire for better things, which means that they would be willing to labor to accomplish better results, but they lack in knowledge. It is the duty of such organizations as the Chicago Archi-Business Association to teach the peotects' ple how they may accomplish these desired

Death has visited our midst during the past year, and has removed from our mem-bership Mr. J. P. Doerr, one of our long-time members and faithful attendants at the meetings of the Association. Mr. Doerr and his brother were always seen together; in fact, it seemed to be one of the customs of the members to speak of the "Doerr Broth collectively, rather than individually. Brothers" their associations seemed to be so intimate their associations seemed to be so intimate and happy. 'Tis with great sadness that we note the separation of this intimate association between blood brothers, as well as the severance of the fraternal relation between professional brethren. The Association extends to Mr. Doerr's family its most sincere sympathy in their loss.



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## THE CHICAGO ARCHITECTS' BUSINESS ASSOCIATION CANONS OF PROFESSIONAL ETHICS

#### Preamble.

The architect is engaged in a profession which carries with it grave responsibilities to the public. These duties and responsibilities cannet be met unless the motives, conduct and ability of the members of the profession are such as to command respect and confidence.

The profession of architecture calls for men of the highest integrity, and executive and artistic ability.

The architect is entrusted with financial undertakings where his honesty of purpose must be above suspicion; he acts as professional adviser to his client, and his advice must be absolutely disinterested: he is charged with the exercise of judicial functions as between client and contractor, and must act with entire impartiality, and he has moral responsibilities toward his professional associates and subordnates.

The people of the State of Illinois have a right to expect a high standard of practice and conduct on the part of the architects whom they have licensed to practice. Because an architect is a quasi public official it is imperative that he assume no obligations which shall place official duty and self-interest in conflict.

#### The Canons of Ethics.

No set of rules can be framed which particularize all the duties of the architect in his various relations to the public, to his client, to the building trades and to his professional brethren.

The following canons of ethics cover certain broad principles which should govern the conduct of members of the profession and should serve as a guide in circumstances other than those enumerated:

#### I.—On Certain Duties to the Public.

The architect's more important work is of a character so permanent and enduring that he owes it to the public to use his best efforts to make it such as may raise the standard of taste in the community and be in itself a public ornament. He should design with due regard to surroundings and should endeavor to check any individualism, whether in himself or

his client, that is opposed to the public good. He should take part in those movements for public betterment in which his training and experience enable him to give useful service. He should insist on safe and sanitary construction and he should at all times hold the safe guar.ling of human life and health as of paramount importance to the interests of client, contractor or self.

#### II.-On the Architect's Status.

The architect's relation to his client is primarily that of professional advisor. This relation maintains throughout the entire period of his service. When, however, a contract is executed between his client and a builder or other person by the terms of which the architect becomes the official interpreter of its conditions and the judge of its performance, a new relation is cre-In respect to the matters under contract, it is incumbent upon the arcnitect to side neither with the client nor contractor, but to endeaver, in so far as his action may determine, that the contract be faithfully carried out according to its true spirit and intent.

It is not proper for the architect to assume to act as the owner's agent unless he has been specifically empowered so to act: by so doing he becomes a party to the contract and in a sense disqualified in his judicial capacity.

The fact that the architect's payment comes through the client does not invalidate his professional obligation to act with impartiality to both parties to the contract. It is essential, however, in order to eliminate the influence of self-interest, that the architect shall not enter into any contract with the client which shall condition his payment upon his decisions or advice.

### III.—On Preliminary Drawings and Estimates.

The architect should impress upon his client at the outset the importance of sufficient time for the study and preparation of drawings and specifications. If, on the basis of approved preliminary

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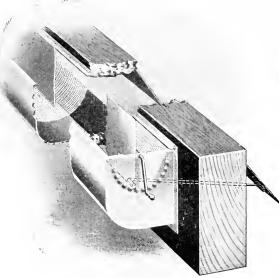
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sketches, the approximate cost of the work has been mutually considered, the architect should endeavor to bring his working drawings to meet such approximate cost, provided that his client has requested no departure from the original basis of esti-But at the same time he should acquaint his client with the conditional character of preliminary estimates. Complete and final figures can be had only from complete and final drawings and specifications. If an unconditional limit of cost is imposed before such drawings are made and estimated, the architect must be free to make such adjustments as seem necessary to that end.

### IV.—On Superintendence and Expert Service.

On all work except the simplest, it is to the interest of the client to employ an inspector or clerk-of-the-works; in many engineering problems and in certain esthetic problems such as sculpture, decorative painting, gardening and the like, it is to the interest of the client to have specialized expert service. The architect should so inform the client and assist him in obtaining such service. In order to secure unified and harmonious working organization, only such persons should be selected by the owner for consulting experts as shall work in harmony with the architect and shall be approved by him.

#### V .- On the Architect's Charges.

The schedule of charges of the Chicago Architect's Business Association is recognized as a proper minimum of payment, but where no other architect is affected it is allowable for an architect to make such an arrangement with his client as is mutually satisfactory. He may not reduce his fee below the schedule of charges in an attempt to supplant another architect; it is reasonable and proper to charge higher rates than those of the schedule when his special skill and the quality of his service justify the increase.

A system of compensation based on the actual cost to the architect on a given piece of work plus an agreed professional fee, has much to commend it.

#### VI.-On Needless Expenditure.

The architect should scrupulously guard cost, and refrain from introducing need-

less expense or any extravagance in material or construction that may add to cost of building, without compensating gain to the client.

#### VII.—On Payments for Expert Service.

When retained as an expert, whether in connection with competitions or otherwise. the architect should receive a compensation proportionate to the responsibility and difficulty of the service. No duty of the architect is more exacting than such service, and the honor of the profession is involved in it. Under no circumstances should experts, knowingly, name prices in competition with each other for a given employment. Where governmental regulations prohibit adequate compensation for expert service, it is better to render such service without emolument than to accept a payment out of proportion to the importance of the service rendered.

### VIII.—On the Selection of Bidders or Contractors.

The architect should advise his client in the selection of bidders and in the award of contract.

In selecting none but worthy bidders and in advising the award only to contractors who are honest and competent, the architect protects the interests of his client and helps to raise the ethical standard in building.

#### IX.-On Duties to the Contractor.

On the signing of a contract between owner and builder, the architect is placed in a judicial position and is bound to act with absolute fairness; he is also judge in his own right, deciding whether or not the intent of his plans or specifications is properly carried out, and exercising his judgment as to the true meaning thereof. He should, therefore, take special care to see that these drawings and specifications are complete and accurate, and he should never call upon the contractor to make good his own oversights or errors, or attempt to shirk responsibility by "blanket" clauses.

#### X .- On Engaging in the Building Trades.

The architect should not engage in any of the building trades, nor should he form any trade partnership or agreement with any person or firm connected therewith;

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nor should he have any financial interests in any building material or device of such a nature as to render his professional action liable to a suspicion of self-interest; if he have any interest in building material or device, he should not specify or use the same without the full knowledge and approval of his client.

XI.-On Accepting Commission or Favors.

The architect may not receive any commission or any substantial service or favor from a dealer, a contractor, or from any interested person other than his client.

XII .-- On Encouraging Good Workmanship.

In his authority to interpret and enforce the provisions of the contract, the architect is vested with large powers which he should use with unbiased judgment. While he must condenin bad work, he should also make a point of commending that which is good.

Intelligent initiative, artistic or mechanical, on the part of craftsmen and workmen, should be promptly recognized and encouraged, and the architect should make evident his appreciation of the dignity and importance of their work.

XIII.—On Offering Service Gratuitously.

The offering of professional service on approval, unless warranted by personal or previous business relations, tends to lower the dignity and standing of the profession: also to provide motive for dishonest representation and is to be condemned.

XIV.—On Advertising.

Advertising in any form is to be discouraged as tending to lower the standing of the profession. The presentation of ordinary business cards is a matter of individual taste and not per se improper; but the solicitation of work by circulars or advertisements and the inspiring or inserting of self-laudatory notice in the press are unprofessional.

The best recommendation of an architect is a well-merited reputation for professional capacity and fidelity to trust.

### XV.—On Signing Buildings and Use of Titles.

The signing of buildings has the indorsement of the Chicago Architect's Business Association. The use of the initials designating degrees or technical society membership is proper in connection with any professional service and is encouraged as helping to make known the nature of the honor they imply.

XVI.—On Competitions.

In no way does the architect come more conspicuously before the public than through competitions. It is especially desirable that in such circumstances he should conduct himself with self-respect and dignity. To under value and cheapen his service or to compete where a just

award is not safe guarded is inconsistent with this position. Competitions are undesirable from the standpoint of both the client and the architect and a member of of the Association should discourage the holding of same. If a competition becomes inevitible, because of governmental regulations, he should not enter either as a competitor or a professional advisor unless the competition is to be conducted according to the best practice and usage of the profession as formulated from time to time by the American Institute of Architeets. Except as an authorized competitor he may not attempt to secure work for which competition has been instituted.

He may not present drawings to secure work for which competition has been closed but not decided.

He may not attempt to influence the award in any competition.

#### XVII.-On the Expert's Future Status.

An architect may not undertake a further commission on any building or work after having acted in an expert capacity in formulating a program which later is put into effect, or after having acted in an advisory capacity in the matter of awards in competition. Having acted in either or both of such capacities should bar an architect from eligibility to execute commissions upon the work in question.

#### XVIII.—On Criticising the Work of Others.

An architect may not criticise publicly in the press the work of a fellow architect except over his own signature, or editorially; and he may not intentionally injure, directly or indirectly, the reputation, prospects or business of a fellow architect.

### XIX.—On Undertaking the Work of An other,

An architect may not undertake a commission while the just claim of a fellow architect, who had previously undertaken it, remains unsatisfied; nor may he attempt to supplant a fellow architect or to obtain a commission after steps have been taken toward the appointment of another architect.

### XX.—On Duties Toward the Student Draughtsman.

It is the duty of the architect to advise and assist those who intend making architecture their career. The intending student should be urged to secure a preparation of broad general culture equivalent to that required for the degree of A. B., concurrently with or followed by a therough course in a well organized school of architecture.

In cases where such preparation is out of the question and the beginner must get his training in the office of an architect, the latter should assist him to the best of

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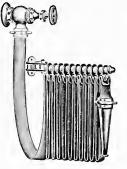
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RUBBER HOSE, BELTING AND PACKING 130 W. Lake St., CHICAGO his ability by instruction and advice. An architect, should, as far as possible, urge his draughtsmen to avail themselves of educational opportunities. To this end he should give encouragement to all worthy schemes and institutions for architectural education.

Members of the association cannot too strongly insist that a thorough technical preparation for the practice of architecture should rest upon a foundation of general culture.

### XXI.—On Duties Toward Building Authorities.

The architect should support all federal, state and municipal onicials who have charge of matters relating to building and engeavor to maintain or improve the standards of their departments. His quasi pubhe omeial capacity requires him to snow respect for law by careful and conscientious compliance with all building regulations, and if any such appear to him unwise or unfair, he should endeavor to have such regulations altered, but until so altered he should comply with them. An architect because of his official relation to the state and of his moral obligation should not even under his client's instructions encourage any practices contrary to law or hostile to public interests; for he is not obliged to accept a given piece of work, hence he cannot urge in extenuation and to escape the condemnation attaching to his acts that he has but followed his client's instructions.

#### XXII.-On Professional Qualifications.

The assumption of the title of architect should be held to mean that the bearer has the professional knowledge, both theoretical and practical, and the natural ability needed for the proper invention illustration and supervision of all building operations which he may undertake.

#### XXIII.—On Matters Adjudged Unprofessional.

The following code, based on a report of a special committee of the American Institute of Architects, is adopted by the Chicago Architects' Business Association as a general guide, yet the enumeration of particular duties should not be construed as the demai of the existence of others equally imperative though not specincally mentioned. It should also be noted that these sections indicate offenses of greatly Varying degrees of gravity:

it is unprofessional for an architect-

1. To engage in any of the building trades or to form any trade partnership or agreement with any person or firm engaged therein.

z. To guarantee an estimate or contract by bond or otherwise.

3. To accept a commission or any substantial service or favor from a contractor, or anyone connected with the building trades.

4. To advertise in any form.

5. To enter any competition the terms of which are not in harmony with principles approved by the American Institute, especially if such terms have been specincally condemned by the American institute or a local chapter thereof.

6. To attempt in any way except as a duly authorized competitor to secure work for which a competition has been instituted.

7. To attempt to influence the award of a competition.

8. To injure intentionally the fair reputation, prospects or business of another architect.

9. To criticise anonymously in the public prints, except editorially, the professional conduct or work of a fellow architect.

10. To undertake a commission while the just claim of another architect who has previously undertaken it remains unsatistied.

11. To attempt to supplant a fellow architect after definite steps have been taken toward his employment.

12. To offer or perform services at rates lower than those approved as minlmum by the Chicago Architects' Business Association in an attempt to supplant or underbid another architect.

13. To act in a manner detrimental to the best interests of the profession.

## SCHEDULE OF PROPER MINIMUM CHARGES AND PROFESSIONAL PRACTICE OF ARCHITECTS RECOMMENDED BY THE CHICAGO ARCHITECTS' BUSINESS ASSOCIATION

1. The architect's professional services consist of the necessary conferences, the preparation of preliminary studies, working drawings, specifications, large scale and full size detail drawings, and of the general direction and supervision of the work, for which, except as hereinafter mentioned, the minimum charge is six per cent (6%), based upon the total cost of the work complete.

In case of the discontinuance or abandonment of the work, the architect's

charge shall be based upon an estimated total cost, which estimated total cost may be determined by the architect, by experts, or by the lowest bids of responsible contractors. Total cost is to be interpreted as the cost of all materials and labor necessary to complete the work, plus contractors' profits and expenses, as such cost would be if all materials were new and all labor fully paid, at market prices current when the work was ordered.

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- 2. On residential work, on alterations to existing buildings, on monuments, furniture, decorative and cabinet work, and landscape architecture, it is proper to make a higher charge than above indicated.
- 3. The architect is entitled to compensation for articles purchased under his direction, even though not designed by him.
- 4. If an operation is conducted under separate contracts, rather than under a general contract, it is proper to charge a special fee in addition to the charges mentioned elsewhere in this schedule.
- 5. Where the architect is not otherwise retained, consultation fees for professional advice are to be paid in proportion to the importance of the questions involved and services rendered.
- 6. Where heating, ventilating, mechanical, structural, electrical and sanitary problems are of such a nature as to require the services of a specialist, the owner is to pay for such services in addition to the architect's regular commission. Chemical and mechanical tests and surveys, when required, are to be paid for by the owner.
- 7. Necessary traveling expenses are to be paid by the owner.
- 8. If, after a definite scheme has been approved, changes in drawings, specifications or other documents are required by the owner; or if the architect be put to extra labor or expense by the delinquency or insolvency of a contractor, the architect shall be paid for such additional services and expense.
- 9. The architect's entire fee is itemized and proportionate payments on account are due the architect, as the following items are completed:

Preliminary Studies	.2
General drawings	_
Specifications	
Scale and full size details	
General Supervision of the work	

- 10. Items of service are comprehended as follows:
- (a) Preliminary Studies consist of the necessary conferences, inspections, studies and sketches modified and remodified to determine the client's problem and illustrate a satisfactory general solution of same, both as to plan and elevation. Illustrative sketches for this purpose need not be to accurate scale, but should be approximately correct as to general dimensions and proportion.
- (b) General Drawings include figured scale plans of the various stories, elevations of all the fronts, such general verti-

cal sections as may be necessary to elucidate the design, and such details, drawn to still larger scale as, with the assistance of printed notes, and of the accompanying specifications, may make the whole scheme clearly evident to the mind of the competent builder and give him a full and complete comprehension of all the structure conditions as they affect the vital questions of quality and quantity of materials, of character of workmanship, and of cost.

- (c) Specifications consist of a supplementary statement in words, of at least all those items of information regarding a proposed building which are not set forth in the drawings.
- (d) Detail Drawings include all the necessary supplementary drawings required for the use of the builders, to enable them to so provide and shape their material that it may be adjusted to its proper place or function in the building with the least delay, and the smallest chance for errors and misfits. If not prepared until after the contract for the building is let they must not impose on the contractor any labor or material which is not called for by the spirit and intent of the "General Drawings" and "Specifications."
- The Supervision of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk-ofthe-works or inspector of construction) means such inspection by the architect or his deputy, of work in studios and shops or a building or other work in process of erection, completion or alteration, as he finds necessary to ascertain whether it is being executed in general conformity with his drawings and specifications or directions. He has authority to reject any part of the work which does not so conform and to order its removal and reconstruction. He has authority to act in emergencies that may arise in the course of construction, to order necessary changes, and to define the intent and meaning of the drawings and specifications. On operations where a clerk-of-the-works or inspector of construction is required, the architect shall employ such assistance at the owner's expense.
- 11. Drawings and specifications, as instruments of service, are the property of the architect.
- 12. Exceptions.

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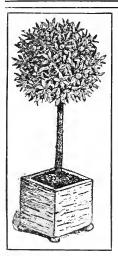
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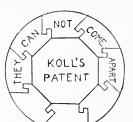
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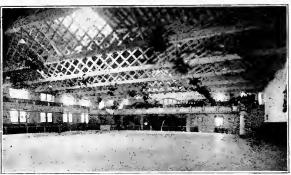
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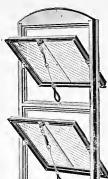
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HENRY ERICSSON	Puilding Commissioner
TORIST BESTER DISTRICT	Chief of Doline
JOHN McWEENEY	. Uniei of Police.
HERMAN F. SCHUETTLER	Assistant Chief of Police.
WILLIAM H. SEXTON	Corporation Counsel.
N. L. PIOTROWSKI	City Attorney.
N. L. PIOTROWSKI	City Prosecutor
JOHN D. RILEY	Man Donartmont
JOHN D. RILLET	, Map Department.
FRANCIS A. EASTMAN	City Statistician.
FRANCIS A. EASTMAN PATRICK WHITE	Superintendent of Bridges.
DR. GEORGE J. SPENCER	City Physician.
DR. CLARA P. SEIPPEL	Asst. City Physician
WILLIAM J. McCOURT.	Cuncrintendent Bureau of Water
WILDIAM J. MCCOURT	. Superintendent, Bureau of water.
OSBORN MONNET	
WILLIAM D. WILCOX	Gas Inspector.
HENRY A. ZENDER ADOLPH W. JANCZEWSKY	)
ADOLPH W. JANCZEWSKY	Board of Examining Engineers.
W. F. MELICAN	( Double of Linearing Lingshore)
TOTAL T TLAT DAY	Detection Deserve
JOHN J. HALPIN	Detective Bureau.
MICHAEL J. RYAN	
	Plants.
N. E. MURRAY	Superintendent of Sidewalks.
CHARLES B. BALL	Chief of Sanitary Bureau.
EDWARD PRITCHARD	Secretary Health Department
DUITTID MONTHAIN	Asting Constant of Bolico
PHILLIP MCKENNA	Acting Secretary of Police.
JOHN ERICSON	, City Engineer.
GEORGE A. SCHILLING	
CLAYTON F. SMITH	
CLAYTON F. SMITH FRED BURKHARD FRANK RYDZEWSKI	Board of Local Improvements
ED ANTE DEPORTURE	Board of Bocar Improvements.
IDANA RIDAEWSKI	
FRANK SIMA	,
EDWARD J. GLACKIN	. Secretary of Board of Local Improvements.
CHARLES F. SEYFERLICH	. Fire Marshal.
WILLIAM E. QUINN	
HENRY E. LEGLER	Librarian
A. W. BEILFUS	
JACOB PROST	
HENRY D. McGURN	. Supt., Bureau of Compensation.
JOHN L. WHITMAN	. Supt., House of Correction.
	• /



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## CITY HALL AND COUNTY BUILDING INFORMATION AND GUIDE.

TAXES: When and Where to Pay.

GENERAL TAXES: State, County and City.

Annually at County Treasurer's Office, County Building, 1st floor, north end. Must be paid before May 1 of each year. Failure to pay before May 1 means a penalty of one (1%) per cent per month until sold. (Then heavier penalty; and trouble.)

SPECIAL ASSESSMENTS: (Street Paving,

Water Pipes, Etc.).
Before March 10, at City Collector's Office,
City Hall. 1st floor, south end. After April 1, at County Treasurer's Office,

County Building, 1st floor, north end.

WATER TAX:

At Bureau of Water, City Hall, 1st floor, north end.

DOG TAX:

City Hall, 1st floor, south end,

OFFICES-NEW CITY HALL.

Architect, City, 10th floor, south end. Bailiff, Municipal Court, 8th floor, north end. Board of Election Commissioners, 3rd floor, south end. Board of Examiners:

Motor Vehicle Operators, 10th floor, north

end. Moving Picture Operators, 10th floor, north

Plumbers, 10th floor, north end. Stationary Engineers, 10th floor, north end. Board of Inspectors of Public Vehicles, 3rd

floor, north end. Board of Local Improvements:

General Offices, 2nd floor, south end.
Public Hearing Room, 1st floor, north end.
Law Department, 2nd floor, south end.
Roiler Inspection, 6th floor, south end.
Buildings, Department of, 7th floor, north

end.

Bridge Division, 4th floor, north end. Business Agent, vault floor, north end. Chief Justice Municipal Court, 9th floor, south end.

City Attorney, 6th floor, north end. City Clerk, 1st floor, south end. City Collector, 1st floor, south end. City Comptroller (5th floor, north end):

General Office.

Auditor. Paymaster.

Real Estate Agent. City Council:

Council Chamber, 2nd floor, north end. General Committee Rooms, 2nd floor, north end

Committee on Finance, 2nd floor, north end, Committee on Local Transportation, 3rd floor, north end.

Commission, Special Park, 10th floor, north end.

6th floor, center. City Electrician. 6th floor, center. City Forester, 10th floor, north end.

City Hall:

Superintendent, 3rd floor, north end.
Chief Janitor, 3rd floor, north end.
City Sealer, vault floor, south end.
City Statistician, 10th floor, north end.
City Treasurer, 2nd floor, center.
Civil Service Commission:

General Offices, 6th floor, south end.

Examining Room, 10th floor, center.
Clerk, City, 1st floor, south end.
Clerk, Municipal Court, Sti floor, south end.
Committee Rooms, City Council, 2nd floor, north end.

Compensation, Bureau of, vault floor, south end.

Corporation Counsel, 5th floor, south end. Engineering, Bureau of (City Engineer), 4th floor, north end.

Election Commissioners, Board of, 3rd floor, south end.

Electricity, Department of, 6th floor, center. Finance Committee, 2nd floor, north end.

Fire Department:

Fire Marshal, 1st floor, north end.
Fire Alarm Telegraph, 6th floor, center.
Firemen's Pension Fund, Secretary of
Board of Trustees (City Clerk), 1st
floor, south end.

Gas Inspector, Bureau of, vault floor, south end.

Harbor Division, 4th floor, north end. Health, Department of, 7th floor.

Commissioner of Health. Bureau of Food Inspection, Bureau of Sanitary Inspection, Bureau of Contagious Diseases, Bureau of Vital Statistics,

Law, Department of: Corporation Counsel, 5th floor, south end.

City Attorney, 6th floor, north end. Prosecuting Attorney, 6th floor, north end. Special Assessment Attorney, 2nd floor, south end.

Local Transportation, Committee on, floor, north end

Local Transportation, Department of (Trac-tion Expert), 3rd floor, north end. Maps and Plats, Bureau of, 4th floor, south

end.

Mayor's Office, 5th floor, center. Motor Vehicle Operators, Ro Board of Examiners, 10th floor, north end. Moving Picture Operators, Board

Board of Examiners, 10th floor, north end. Municipal Court:

Municipal Court:
Chief Justice, 9th floor, south end,
Bailiff, 8th floor, north end,
Clerk, 8th floor, south end,
Court Rooms, 8th, 9th and 11th floors,
Oils, Inspector of, 10th floor, south end. Police Department:

General Superintendent, 5th floor, north end.

Assistant General Superintendent, 3rd floor, center. Plumbers, Board of Examiners of, 10th floor,

north end.

Prosecuting Attorney, 6th floor, north end. Public Works:

Commissioner, 4th floor, center. Bureau of Engineering, 4th floor, north end.

Bridge Division, 4th floor, north end. Harbor Division, 4th floor, north end. Bureau of Maps and Plats, 4th floor, south

end.

end. Bureau of Sewers, 4th floor, south end. Bureau of Streets, 4th floor, south end. Bureau of Water, 1st floor, north end. Water Pipe Extension Division, 4th floor,

north end. Sanitary Inspection, Bureau of, 7th floor, center.

Sewers, Bureau of, 4th floor, south end. Smoke Inspection, Department of, 6th floor, south end.

south end.

Special Assessments (Board of Local Improvements), 2nd floor, south end.

Special Assessments (Law Department), 2nd floor, south end.

Special Park Commission:

Secretary, 10th floor, north end.
City Forester, 10th floor, north end.
Stationary Engineers Board of Examiners

Board of Examiners

City Forester, 10th floor, north end.
Stationary Engineers, Board of Examiners
of, 10th floor, north end.
Statistician, City, 10th floor, north end.
Steam Boilers and Steam Plants, Department
of Inspection of, 6th floor, south end.
Streets, Bureau of, 4th floor, south end.
Streets, Bureau of, 4th floor, south end.

Supplies, Department of (Business Agent), yault floor, north end. Track Elevation, Department of, 10th floor,

north end.



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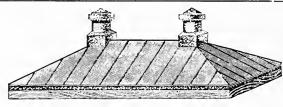
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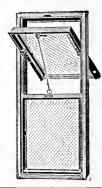
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north end.

Water, Bureau of, 1st floor, north end. Water Pipe Extension Division, 4th floor, north end.

Weights and Measures, Department of, vault floor, south end.

### OFFICES-COUNTY BUILDING.

### AUDITOR:

Wm. K. Krueger. R. 512, 5th floor.

### BOARD OF ASSESSORS:

Walter E. Schmidt, President. William H. Weber, Secretary. August W. Miller. Adam Wolf. Frank W. Koraleski. R. 312, 3rd floor.

### BOARD OF REVIEW:

Fred W. Upham, President. Thomas J. Webb, Secretary. Roy O. West. R. 337, 3rd floor.

### CIRCUIT COURT:

Clerk:

Joseph E. Bidwell, Jr. R. 512, 4th floor.

Hon. John Gibbons. Hon. George Kersten. Hon. Richard S. Tuthill. Hon. Richard S. Tutnin, Hon. Kickham Scanlan. Hon. Frederick A. Smith, Hon. Merritt W. Pinckney. Hon. Lockwood Honore, Hon. Charles M. Walker, Hon. Edward O. Brown. Hon. Thomas G. Windes, Hon. Adelor J. Petit Hon. Adelor J. Petit. Hon. Jesse A. Baldwin. Hon. Frank Baker.

### CIVIL SERVICE COMMISSION:

Ballard Dunn, President. John H. Fichter, Secretary. Frederick Greer. R. 547, 5th floor.

### CLERK, COUNTY:

Robert M. Sweitzer. R. 233, 2nd floor.

### COMPTROLLER, DEPUTY COUNTY:

Frank S. Ryan. R. 511 5th floor.

### CORONER:

Peter M. Hoffman. R. 500, 5th floor. COUNTY ATTORNEY:

Gustavus J. Tatge. R. 507, 5th floor.

### COUNTY CLERK:

Robert M. Sweitzer. R. 233, 2nd floor.

### COUNTY COMMISSIONERS, BOARD OF:

Peter Bartzen, President. From City of Chicago: Peter Bartzen. Joseph Mendel. Lawrence J. Coffey. Charles Glennon. Dr. George Sultan. Dr. George Sultan.
Frank Ragen.
Joseph M. Fitzgerald.
Bartley Burg.
Stanley Kuflewski.
Daniel J. Harris.
From Outside of City:
William Busse.
August C. Boeber.

William C. Hartray. Joseph Carolan. Alfred Van Steenberg. Robert M. Sweitzer, Clerk. R. 537, 5th floor.

COUNTY COURT:
Hon, John E. Owens, Judge.
R. 602, 6th floor.
Robert M. Sweitzer, Clerk.

R. 600, 6th floor.

### COUNTY SUPERINTENDENT OF SCHOOLS:

Edward J. Tobin. R. 546, 5th floor.

### COUNTY TREASURER:

Wm. L. O'Connell, Office, R. 212, 2nd floor, General Office, 1st floor, north end.

### CUSTODIAN, COUNTY BUILDING:

L. A. Brundage. R. 226, 2nd floor.

### JURY COMMISSIONERS:

W. A. Amberg. President. Jos. H. Barnett James A. McLane. R. 824, 8th floor.

### PROBATE COURT:

Hon. Chas. S. Cutting, Judge. R. 643, 6th floor. John A. Cervenka, Clerk, R. 623, 6th floor.

#### RECORDER OF DEEDS:

Abel Davis. 1st floor, south end.

#### REGISTRAR OF TITLES (Torrens System):

Abel Davis. 1st floor, south end.

### REVIEW, BOARD OF:

R. 337, 3rd floor.

### SHERIFF:

Michael Zimmer. R. 423, 4th floor.

### SUPERIOR COURT:

Judges:

Idon. Theodore Brentano.

Hon. Farlin Q. Ball.

Hon. Marcus A. Kavanagh.

Hon. Ben M. Smith.

Hon. Wm. H. McSurely.

Hon. Chas. A. McDonald.

Hon. Richard E. Burke.

Hon. Joseph H. Fitch.

Hon. Wm. F. Cooper.

Hon. Wm. F. Cooper.

Hon. Martin M. Gridley.

#### Clerk:

Chas. W. Vail. R. 437, 4th floor.

### SUPERINTENDENT OF PUBLIC SERVICE:

James M. Slattery. R. 519, 5th floor.

### SUPERINTENDENT OF SCHOOLS (COUNTY):

Edward J. Tobin. R. 546, 5th floor.

### SURVEYOR:

Edgar A. Rossiter. R. 1026, 10th floor.

### TORRENS SYSTEM:

Abel Davis, Registrar. 1st floor, south end.

### TREASURER, COUNTY:

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# BUILDING ORDINANCE

## OF THE CITY OF CHICAGO

Passed by the City Council December 5, 1910.

Comprising Sections 199 to 727, inclusive.

EFFECTIVE JANUARY 9, 1911.

All amendments up to July 22, 1912, will be found printed in italics under proper Section numbers, except the Fire Limits Ordinance (Section 718.) A star ★ marks all amended sections.

Attention is called to the several new ordinances following the building ordinance, having to do, or in connection with the erection or location of buildings.

#### AN ORDINANCE.

Relating to buildings within the City of Chicago.

Chicago.

Be it ordained by the City Council of the City of Chicago:
Section 1. That there is hereby added to the Revised Municipal Code of Chicago of 1905 a new Chapter, to be known as Chapter XV, which shall read as follows:

### CHAPTER XV.

ARTICLE I.

Buildings.

\*199. Department of Buildings Established -Officers.) There is hereby established an executive department of the municipal government of the City of Chicago which shall be known as the Department of Buildings which shall embrace a Commissioner of Buildings, a Deputy Commissioner of Buildings, an Engineer in charge, a Building Inspector in charge, an Elevator Inspector in charge, a Fire Escape Inspector in charge, a Secretary to the Commissioner of Buildings and such number of Assistant Engineers in charge, Assistant Building Inspectors in charge, Building Inspectors, Elevator Inspectors, Fire Escape Dunang Inspectors, and such other officers, assistants and employes as may be from time to time frovided for in the annual appropriation ordinance.

\*Amended May 27, 1912.

\*200. Building Commissioner—Appointment—Bond—Other Officers—Offices Created.) (a) There is bereby created the office of Commissioner of Buildings. He shall be the head of said department of buildings and shall be an experienced architect, or a civil, structural or architectural engineer or a building contractor or an efficient building mechanic and shall have been engaged as an architect or a civil, structural or arbitrarily and shall building mechanic and shall have been engaged as an architect or a civil, structural or arbitrarily and shall be a s chitectural engineer or building contractor or building mechanic for a period of not less than ten years prior to his appointment; and during his term of office as Commissioner of Buildings he shall not be engaged in any other business.

(b) He shall be appointed by the Mayor, by and with the advice and consent of the

City Council.
(c) The Commissioner of Buildings before entering upon the duties of his office shall execute a bond to the city in the sum of twenty-five thousand dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of his duties as the Commissioner of Buildings.

(d) There are hereby created the offices of Deputy Commissioner of Buildings, Engineer in charge, Building Inspector in charge, Elevator Inspector in charge, Fre Escape Inspector in charge,

Secretary to the Commiss oner of Buildings, Assistant Engineer in charge and of such number of Assistant Building Inspectors on charge, Building Inspectors, Elevator Inspectors and Five Escape Inspecters as may be from time to time provided for in the annual appropriation ordinace. The incumbents of these offices shall be known and designated by their respective titles as herein set forth.

\*Amended May 27, 1912, by adding C(d). \*Amended May 2), 1912, by adding (0), 2001½, Powers—Appointment of Subordinates—Duties of Commissioner.) (a) He shall have the management and control of all matters and things pertaining to the department of buildings, and shall appoint, and may remove according to law, all subordinate officers and assistants in his department. ordinate officers and assistants in his deordinate officers and assistants in his de-partment. All subordinate officers, assist-ants, clerks and employes in said depart-ment shall be subject to such rules and regulations as shall be prescribed from time to time by said commissioner.

The Commissioner of Buildings shall institute such measures and prescribe such rules and regulations for the control and guidance of his subordinate officers and employes as shall secure the careful inspec-tion of all buildings which in process of construction, alteration, repair or removal and the strict enforcement of the several

provisions of this chapter.

(c) It shall be the duty of said commissioner and his assistants to enforce all ordinances relating to the erection, construc-tion, alteration, repair, removal or the

safety of buildings.

tion, alteration, repair, removal or the safety of buildings.

(d) In all cases, where any action is taken by the Commissioner of Buldings to enforce the provisions of any of the sections continued in this chapter or to enforce the provisions of any of the building ord nances of the city now or at any time hereafter in torce, whether such action is taken in pursuance of the express provisions of such sections or ardinances or no acsae where discretionary power is given by the ordinances, such acts shall be done in the name of and on behalf of the City of Chicago, and the sid Commissioner of Buildings in so acting for the city shall not render himself linde personally, and he is hereby releved from all personal tability, for any danage that may accent to persons or property as a result of any such act permitted in good fifth in the discharge of his duties, and any such brought against the said Commissioner of Buildings by reason thereof shall be defended by the Department of Law of said city until the final termination of the proceedings therein

\*\*Amended Dec. 18, 1911, by a bling \*\*(d), (d) 201. \*\*Inspection of all Buildings in

(d) 201. Inspection of all Buildings in General Use—Precautions in Behalf of Pub-General Use—Precautions in Benail of Public Safety—May Require Repair or Alteration in Such Cases—Interpretation of this Chapter. (a) The Commissioner of Buildings shall inspect or cause to be inspected all

public school buildings, public halls, churches, theaters, buildings used either for manufacturing or commercial purposes, hotels, apartment houses and other build-ings or structures occupied or frequented by large numbers of people, for the purpose of determining the safety of such buildings, or any parts or appliances or equipment thereof; the sufficiency of their doors, passageways, aisles, stairways, corridors, exits or fire escapes and generally their facilities for egress in case of fire or other accidents, and the strength of their floors, and he shall make return of all violations of the several provisions of this chapter to the Law De-

partment for prosecution.

(b) It shall be the duty of the Commissioner of Buildings, when any citizen represents that combustible materials are kept in any place in the city in an insecure manner, or that the doors, stairways, corridors, exits or fire escapes in any factory or workshop or other place of employment are insufficient for the escape of employes in case of fire, panic or accident, or do not comply with the provisions of this Chapter; or that the funnels, flues, fire boxes, or heating apparatus in any building in the city are insecure or dangerous, or that any part of insecure or dangerous, or that any part of any building in the city is in an unsafe or dangerous condition or in any wise in con-travention of this Chapter, to make an ex-amination of such place or building, and if such representation is found to be true, said Commissioner shall give notice in writsaid Commissioner snau give nouse in wining to the owner, occupant, lessee, or person
in possession, charge or control of such
place or building to make such changes,
alterations or repairs as safety or the ordinance of the City may require. Upon failure nance of the City may require. Upon failure of parties so notified to comply with said notice the matter shall be placed in the Law Department for prosecution.

(c) It shall be unlawful to continue the use of such building until use of such building until the changes, alterations or repairs found necessary by the Commissioner of Buildings to make such building or part thereof safe or to bring it into compliance with this Chapter,

shall have been made.

(d) The Commissioner of Buildings shall have full power to pass upon any question arising under the provisions of this chapter, subject to the conditions, modifications, and limitations contained therein.

202. Buildings Found in Unsafe Condition—Notice to Owner—Authority of Commissioner.) (a) Whenever the Commismissioner.) (a) Whenever the Commissioner of Buildings shall find any buildings or structure or part thereof in the city in such an unsafe condition as to endanger life, but in such condition that by the immediate application of precautionary measures such danger may be averted, he shall have authority, and it shall be his duty, to forthwith notify, in writing the owner, agent or person in possession, charge or control of such building or structure or part thereof, to adopt and put into effect such precautionary measures as may be necessary or advisable in order to place such building or structure or part thereof such building or structure or part thereof in a safe condition; such notice shall state briefly the nature of the work required to be done and shall specify the time within which the work required to be done shall be completed by the person, firm or corporation notified, which shall be fixed by said Commissioner of Buildings, upon taking into consideration the condition of such building or structure or part thereof, and the danger to life or property which may result from its unsafe condition.

(b) Whenever such Commissioner of Buildings shall be unable to find the owner such building, structure or part thereof. or any agent or person in possession, charge or control thereof, upon whom such notice may be served, he shall address, stamp and mail such notice to such person or persons at their last known address, and in addition thereto shall place or cause to be placed the notice herein provided for upon such building at or near its principal entrance, and shall also post or cause to be posted in a conspicuous place at each entrance to such building, in large letters, a notice as fol-

lows:

"THIS BUILDING IS IN A DANGEROUS CONDITION AND HAS BEEN CONDEMNED BY THE BUILDINGS." BUILDINGS.

It shall be unlawful for any (c) It shall be unlawful for any person, firm or corporation to remove said notice

or notices without written permission from the Commissioner of Buildings.

(d) If at the expiration of the time (d) 11 at the expiration of the time especified in such notice for the completion of the work required to be done by the terms of such notice, in order to render the building or structure safe, said notice shall not have been complied with and said not have been complied with, and said building or structure is in such an unsafe condition as to endanger life or property, it shall be the duty of the Commissioner of shall be the duty of the commissioner of Buildings to proceed forthwith to tear down or destroy that part of said building or structure that is in such unsafe condition as to endanger life or property, and in cases where an unsafe building or structure can-not be repaired or rendered safe by the application of precautionary measures, such building or structure, or the dangerous parts thereof, shall be torn down by said Com-missioner of Buildings or by his order and the expense of tearing down any part of such building or structure shall be charged to the person owning or in possession, charge or control of such building or structure or part thereof, and the said commissioner shall recover or cause to be recovered from such owner or person in possession, charge or control thereof the cost of doing charge or control thereof the cost of doing such work, by legal proceedings prosecuted by the Law Department.

(e) If the owner, agent or person in possession, charge or control of such build-

ing or structure, or part thereof, when so notified, shall fail, neglect or refuse to place such building or structure, or part thereof, in a safe condition, and to adopt such precautionary measures as shall have been specified by said commissioner within the specified in such notice, in such case. time at the expiration of such time it shall be unlawful for any person, firm or corporation to occupy or use said building or structure, or any part thereof, until said building or structure or part thereof is placed in a safe condition, and in case where a building or structure, or part thereof, is in a dangerous or unsafe condition and has not been placed in a safe condition within the time specified in the notice of the Com-missioner of Buildings, such building or structure, or such part thereof, shall be forthwith vacated, and it shall be unlawful for any person or persons to enter same ex-cept for the purpose of making repairs re-quired by the Commissioner of Buildings and the ordinances of the City of Chicago.

203. Building or Part of Building Constructed or Being Constructed in Violation of Chapter—Authority of Commissioner to Tear Down.) (a) Whenever it shall be Tear Down.) (a) Whenever it shall be found that any building or structure, or part thereof, is being, or shall have been constructed or built in violation of any of the structed or built in violation of any of the provisions of this chapter, the Commissioner of Buildings shall forthwith notify the owner, agent, superintendent or architect of, or the contractor engaged in erecting such building or structure, or part thereof, of the fact that such building or structure, or part thereof, has been, or is being, constructed or erected contrary to the provisions of this chapter, and shall specify briefly in such notice in what manner the provisions of this chapter, or any of them, have been violated, and shall require the person so notified to forthwith make such building, structure, or part thereof, conform to and comply with the provisions of this chapter, specifying in such notice the time within which such

work shall be done.

If, at the expiration of the time set (b) forth in such notice, the person so notified shall have refused, neglected or failed to shall comply with the request made in such notice and to have such building or structure, or part thereof, concerning which notice was sent, changed so as to conform to and comply with the provisions of this chapter, the Commissioner of Buildings shall have the authority, and it shall be his duty to proceed forthwith to tear down or cause to be torn down such building or structure, or such down such part thereof as shall or may have been erected and constructed in violation of the provisions or any of the provisions of this chapter, and the cost of such work shall be charged to and recovered from the owner of such building or structure or from the person for whom such building or structure is being erected, in legal proceedings prose-cuted by the Law Department.

204. May Direct Fire Department to Remove.) The Commissioner of Buildings shall have authority to direct the Fire Marshal to tear down any defective or danmove.) gerous wall or structure or any building or structure or part thereof which may be con-structed in violation of the terms of this chapter, after written notice has been served chapter, after written notice has been served upon the owner, lessee, occupant, agent or person in possession, charge or control, directing him or them to tear down or remove any defective wall, building or structure, or any part thereof, which is in a dangerous condition, which has been, or is being, constructed or maintained in violating the structure of this charter. dangerous condition, which has been, or is being, constructed or maintained in viola-tion of the terms of this chapter. In case of the destruction or partial destruction of buildings by fire, decay or otherwise, when any department of the city government. any department of the city government, pursuant to the ordinances of the city, shall make an outlay of money or incur any liability for the payment of any expense on behalf of the city in an effort to preserve or prevent the destruction of such building or buildings, or structure, or for the preservation of life of the citizens it shall be the tion of life of its citizens, it shall be the duty of the Commissioner of Buildings to ascertain the amount of such outlay or expenditure and present a bill therefor to the owner or owners of any such building or buildings, or its or their agent or agents, and it shall be the duty of said Commissioner of Buildings to refuse to issue a permit for the construction, re-construction, alteration or repair of any building or buildings or structure by any such owner or owners, lessee, occupant, agent or person in possession, charge or control thereof until such outlay or expenditure shall be repaid to the city by the owner, lessee, occupant. agent or person in possession, charge or control of such building or buildings thus totally or partially destroyed in the manner aforesaid. Said commissioner shall also proceed forthwith to collect the amount of such bill from such owner or owners, by legal proceedings prosecuted by the Law Department.

205. May Stop Construction and Wrecking of Buildings.) (a) Said commissioner shall have power to stop the construction of any building or the making of any alterations or repairs of any building within said city when the same is being done in a reckless or careless manner or in violation of any ordinance, and to order, in writing or by parole, any and all persons in any way or manner whatever engaged in so constructing, altering or repairing any such building, to stop and desist therefrom.

(b) And the said commissioner shall have power to stop the wrecking or tearing ations or repairs of any building within said

down of any building or structure within said city when the same is being done in a reckless or careless manner or in violation of any ordinance or in such a manner as to endanger life or property, and to order any and all persons engaged in said work to stop and desist therefrom. When such stop and desist therefrom. When such work has been stopped by the order of said commissioner, it shall not be resumed until said commissioner shall be satisfied that adequate precautions will be taken for the protection of life and property, and that said work will be prosecuted carefully and in conformity with the ordinances of the

206. Arbitration—Appeal from Decision.)
(a) In all cases where discretionary power is given to the Commissioner of Buildings to estimate damage to buildings. as also in questions relating to the security of any building or buildings or structures, or part thereof, and in all other cases where discretions. thereof, and in all other cases where dis-cretionary powers are given by ordinance to the Commissioner of Buildings, any party or parties believing themselves injured or wronged by the decision of the Commissioner of Buildings must, before instituting any suit, make an appeal for arbitration as follows, to-wit:

Any person wishing to make an appeal shall do so within five days after writ-ten notice of the decision or order of the Commissioner of Buildings has been given. An appeal made later than five days after An appear made rater than he was said the serving of the notice of the Commis-sioner of Buildings shall not entitle the appellant to any arbitration. The request for arbitration shall be in writing and shall state the object of the proposed arbitration and the name of the person who is to repre-

sent the appellant as arbitrator.

(c) The Commissioner of Buildings shall thereupon inform the appellant of the cost of such arbitration and such appellant shall, within twenty-four hours from the receipt of such information, deposit with the Commissioner of Buildings the sum of money requested for defraying the expense of the same, which sum shall be fixed in each case by said commissioner in proportion to the time it will take and the difficulty and im-portance of the case, but shall in no case be more than the cost of similar service in course of ordinary business of private individuals or corporations. As soon as such sum of money shall have been deposited with him, the Commissioner of Buildings shall appoint an arbitrator to represent the shall appoint an arbitrators the represent the city and the two arbitrators thus chosen shall, if they cannot agree, select a third arbitrator, and the decision of any two of these arbitrators shall, after investigation and consideration of the matter in question. be final and binding upon the appellant as well as the city unless an appeal is taken therefrom, as provided in case of an appeal under a statutory arbitration, within days thereafter.

207. Arbitrators to Take Oath—Power to Examine Witnesses.) The arbitrators shall themselves, before entering upon the disthemselves, before entering upon the dis-charge of their duties, he placed under oath by the City Clerk, to the effect that they are unprejudiced as to the matter in ques-tion and that they will faithfully discharge the duties of their position. They shall have the power to call witnesses and place them under oath, and their decision or award shall be rendered in writing, both to the Commissioner of Buildings and to the the Commissioner of Buildings and to the appellant. The fee deposited by the appellant with the Commissioner of Buildings shall be paid by the Commissioner of Buildings to the arbitrators upon the rendering of their report and shall be in full of all costs incident to the arbitration; but should the decision of said board of arbitration be rendered against the Commissioner of Publication they the money denosited by the Buildings, then the money deposited by the

aforesaid appellant shall be returned to him and the entire cost of such arbitration shall be paid by the city.

- 208. In Urg Power Final.) Cases-Commissioner's Urgent Whenever the decision of the Commissioner of Buildings upon the safety of any building or any part thereof is made in a case which is so urgent that failure to properly carry out his orders to demolish or strengthen such building or part thereof may endanger life and limb, the decision and order of the Commissioner of Buildings shall be absolute and final.
- 209. Duty of Police to Assist Commissioner in Enforcing Provisions of this Chapter.) Whenever it shall be necessary, in the opinion of the Commissioner of Buildings, to call upon the Department of Police aid or assistance in carrying out or orcing any of the provisions of this enforcing any of enforcing any of the provisions of this chapter, he shall have the authority so to do, and it shall be the duty of the Department of Police, or of any member of said department, when called upon by said commissioner, to act according to the instruc-tions of, and to perform such duties as may be required by said commissioner in order to enforce or put into effect the provisions of this chapter.
- 210. Certificates—Notices—Register.) (a)
  The Commissioner of Buildings shall sign
  or cause to be signed all certificates and
  notices required to be issued from the Department of Buildings and shall keep a
  record of the same, and shall issue or cause to be issued all permits authorized by this

chapter.
(b) He shall also keep a proper record of all transactions and operations of the department and such record shall be at all times open to the inspection of the Mayor. Comptroller, Superintendent of Police, Fire Marshal and members of the City Council.

211. Must Keep Account of Fees Paid—Annual Reports and Estimates.) (a) Said commissioner shall keep in proper books for that purpose an accurate account of all thes charged, giving the name of person to whom same is charged, date on which said charge is made, and the amount of each such

(b) He shall also, annually, on or before the first day of February in each year pre-pare and present to the City Council a report showing the receipts and expenditures and entire work of the Department of Buildings during the previous fiscal year and he shall on or before November first of each year prepare and submit to the Comptroller an estimate of the whole cost and expense of providing for and maintaining his office during the ensuing fiscal year.

Examination and Approval of Plans -Record of Inspections and Complaints.) Commissioner of Buildings and his assistants shall pass upon all questions relating to the strength and durability of buildings or structures; shall examine and approve all plans before a permit is issued for the construction of any building or structure. The Commissioner of Buildings shall cause to be kept a complete record showing the legation and character of every building or other structure for which a permit is issued and shall cause to be filed report of inspection made on such ng, which reports shall bear the sigbuilding, natures of the inspectors making such inspections. He shall cause to be kept a spectrons. The shall cause of the building laws and shall cause all such complaints to be investigated.

\*213. Deputy Commissioner of Buildings—Duty.) (a) There is hereby created the office of Deputy Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this office shall be either a civil, structural or architectural engineer or an architect, an experienced building con-tractor or an efficient building mechanic with

at least five years' experience and training.

(b) The Deputy Commissioner of Buildings shall act as Commissioner of Buildings in the absence of the Commissioner of Buildings ings from his office and while so acting shall discharge all the duties and possess all the powers imposed upon or vested in the Commissioner of Buildings.

(c) The deputy commissioner of buildings shall, under the direction of the Commissioner of shail, whater the arection of the Commissioner of Buildings, have general control of all matters and things pertaining to the work of the Department of Buildings and shall perform such other duties as may be required of him by the Commissioner of Buildings.

\*Amended February 20, 1911.

214. Engineer in Charge—Duties.) (a)
There is hereby created the office of Engineer in Charge, of the Department of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this position shall be a civil. structural, or architectural en-gineer of at least five years' experience and

- training.

  (b) The Engineer in Charge shall be in immediate charge of the engineering work and staff of the Department of Buildings. The examination of plans submitted for the purpose of obtaining a permit, except as to matters elsewhere expressly assigned by law to some other department of the city gov-ernment, shall be the duty of the Engineer in Charge and the engineering staff under his charge. The approval and stamp of the Engineer in Charge shall be required on the plans for the erection, enlargement, alteration, repair or removal of every building before a permit for such erection, enlarge ment, alteration, repair or removal shall be issued. The Engineer in Charge shall have charge of all tests of materials and systems of construction submitted for the approval of the Commissioner of Buildings. The Engineer in Charge shall pass upon the number, location, width and design of all fire-escapes required for new buildings, and he shall also pass upon the number, location, width and design of fire-escapes to be erected on existing buildings wherever such existing buildings are being enlarged, altered or remodeled under a building permit issued for such enlargement, alteration or remodeling. shall perform such other duties as may be required of him by the Commissioner of Buildings.
- 215. Assistant Engineer Duties.) (a) There is hereby created, the office of Assistant Engineer in Charge, of the Department of Buildings. He shall be appropriately a compared of Buildings. pointed by the Commissioner of Buildings according to law. The person certified to fill this position shall be a civil, structural or architectural engineer of at least five years experience and training.

(b) In the absence of the Engineer in Charge, the Assistant Engineer in Charge shall act as Engineer in Charge shall act as Engineer in Charge shall perform such other duties as may be required of him

by the Engineer in Charge.

216. Engineering Staff.) (a) The Commissioner of Buildings shall appoint accordat least four Architectural Ening to law gineers, and such other engineers and assistants as the City Council may by ordinance provide, for service on the engineering staff of the Department of Buildings. Every person certified to fill the position of Architectural Engineer shall be a civil, structural or architectural engineer of at least five years'

training and experience.
(b) The Architectural Engineers shall, under the direction of the Engineer in Charge, examine all plans submitted for the purpose of obtaining a permit. They shall dalso examine and verify the figures on all floor load placards before such placards are approved for posting. They shall perform such other duties as may be required of them by the Engineer in Charge.

217. Building Inspector in Charge— Duties.) (a) The office of Assistant Dep-uty Commissioner of Buildings is hereby abolished and in lieu thereof there is hereby created the office of Building Inspector Charge of the Department of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person buildings according to law. The person certified to fill this position shall be a civil structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years experience in general building construction.

(b) In the absence of the Commissioner of Buildings and the Deputy Commissioner of Buildings from their offices the Building Inspector in Charge shall act as Commissioner of Buildings, and while so acting he shall discharge all of the duties and possess

all of the powers imposed upon or vested in the Commissioner of Buildings.

(c) He shall have immediate charge of the periodical inspection of buildings and of the inspection of buildings and structures being erected, enlarged, altered or repaired, excepting only such inspection as is ex-pressly assigned to the elevator or fire-escape inspectors or is by law assigned to some other department of the city government.

218. Assistant Building Inspectors In Charge.) (a) The Commissioner of Build-ings shall appoint, according to law, at least four Assistant Building Inspectors in

Charge.

(b) Every person certified to fill the posi-tion of Assistant Building Inspector in Charge shall be a civil, structural, architecthraige shail be a chil, structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years' experience in general building construction. The Assistant Euilding Inspectors in Charge shall have immediate charge of the several districts assigned to them by the Commissioner of Buildings and shall perform such other duties as the Commissioner of Buildings shall require of them.

219. Building Inspectors.) (a) The Commissioner of Buildings shall appoint according to law such Building Inspectors

according to law such Building Inspectors as may be necessary.

(b) Every person certified to fill the position of Building Inspector shall be a civil, structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years' experience in general building construction. The Building Inspectors shall, under the direction of the Building Inspector in Charge, examine all Building Inspector in Charge, examine all buildings and structures in the course of erection, enlargement, alteration, repair or removal, as often as is required for efficient supervision, and shall make such periodical examinations of existing structures as shall be assigned to them. They shall examine all buildings, structures and walls reported to be in dangerous condition. They shall examine all buildings and other structures for the enlarging, altering, raising or removing of which, application for permit shall be made.

(c) Every building inspector shall make written reports daily to the Commissioner of Buildings as to the condition in which he found each building examined and as to violations, if any, of the ordinances which the Commissioner of Building is required to violations, if any, of the ordinances which the Commissioner of Buildings is required to enforce, together with the street and number of the premises where such violations, if any, were found, the names of the owner. agent, lessee and occupant thereof, and of the architect and the contractor engaged in the architect and the contractor engaged in and about the work in question. The Building Inspectors snall perform such other duties as may be required of them by the Commissioner of Buildings.

210. Elevator Inspector in Charge.) (a)
There is hereby created the office of nievator Inspector in Charge. He snall be appointed by the Commissioner of Buildings according to law.

to law.

(b) The person certified to fill the pesition of Elevator Inspector in Charge, shall be a graduate in engineering from a recignized technical school, shall be versel in the essentials of both mechanical and electrical engineering and shall have had at least rive years experience in shop or construction

work.

years experience in shop or construction work.

(c) The Elevator Inspector in Charge shall examine all plans for the instanation of elevators and for the instanation of mechanical devices and apparatus in theaters, amusement purks and the fike, and, no such elevator, mechanical device or apparatus shall be installed or operated without the approval of the Elevator Inspector in Charge. The Elevator Inspector in Charge, the Elevator Inspector in Charge shall cause such inspection to be made or all new installations, as may be necessary to insure the carrying out of the approved plans and shall cause such periodic hispection to be made of existing installations of such mechanisms, devices and apparatus, as may be required by the Commissioner of Buildings, and shall perform such other dattes as may be required or him by the Commissioner of Euflaings.

271. Elevator Inspectors.) (a) The Commissioner of Enhances shall appoint according to law such Elevator Inspectors as may be necessary.

may be necessary.

may be necessary.

(b) Every person certified to fill the position of Elevator Inspector shall be a mechanical engineer, machinist or elevator builder, and shall be well grounded in the rudiments of mechanical and electrical entitlements.

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(c) The Elevator Inspectors shall inspect all elevators and such other mechanisms, devices and apparatus as shall be assigned to them by the Inspector in Charge, both existing and in process of being erected or installed, together with all the equipment and enclosures thereof. They shall make written reports daily to the Commission for Duildings as to the condition in which they find the elevators, equipment, enciosures, mechanisms, devices and apparatus, inspected by them, and of any violations of the requirements of this Chapter pertaining to such matters, together with the street and number of the premises where such violations, if any, occur, the names of the owner, agent, lossee and orgapant thereof, and of the architect and contractor engaged in or about the construction and installation of such elevators, equipment, enclosures, mechanisms, devices or apparatus. They shall perform such other daties as may be required of them by the Commissioner of Buildings.

202. Fire-escape Inspector in Charge.)

(a) There is hereby created the affice of Fire-escape Inspector in Charge.) The Elevator Inspectors shall inspect

be appointed by the Commissioner of Build-

ings according to law.

ings according to law.

(b) The person certified to fill the position of Fire-escape Inspector in Charge shall be a civil, structural or architectural engineer, or a man who has had not less than five years' experience in the design and erection of structural steel or in the design and construction of fire-escapes, and he shall be qualified to make all necessary computations as to the strength of any fire-escape, the design of which may be submitted for approval and to pass up in the relative merits of such various types of design as may be so submitted.

- (c) The Fire-escape Inspector in Charge shall have immediate charge of the inspection of the erection of all fire-escapes and of the periodic inspection of fire-escapes, and shall pass upon the number, location, width and design of fire-escapes to be erected upon existing buildings, except where the existing building is being enlarged, altered or remodeled under a building permit issued for such enlargement, alteration or remodeling, in which case the Engineer in Charge shall pass upon the number, location, width and design of all fire-escapes required for new buildings. The Fire-escape Inspector in Charge shall also perform such other duties as may be required of him by the Commissioner of Building.
- 223. Fire-escape Inspectors.) (a) The Commissioner of Buildings shall appoint according to law such Fire-escape Inspectors as may be necessary.
- (b) Every person certified to fill the position of Fire-escape Inspector shall be a person who has had at least four years' experience in superintending the erction of buildings, or in the design or crection of fire-escapes or other steel construction, or who is a graduate of a recognized technical school.
- (e) The (c) The Fire-escape Inspectors shall, under the direction of the Fire-escape Inspector in Charge, inspect all fire-escapes in course of erection and shall make periodic inspection of the fire-escape equipment of inspection of the infe-escape equipment of the existing buildings. Every such inspector shall make, daily, a written report to the Commissioner of Buildings as to the condition of the fire-escape equipment of each building or premises examined, as to the accessibility of and means of egress to such equipment, as to the presumptive adequacy of such equipment, and as to any violations of any ordinance in relation to such equipment, together with the street and number of the building or premises inspected, the names of the owner, agent, lessee and oc-cupant thereof and of the architect and contractor, if any, engaged in operation in connection with such equipment. The Fire-escape Inspectors shall perform such other duties as may be required of them by the Commissioner of Buildings.
- 224. Secretary—Duties.) (a) There is hereby created the office of Secretary to the Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law.
- (b) The Secretary to the Commissioner of Buildings shall, under the supervision and direction of the Commissioner of Buildings, preserve and keep all books, records and papers belonging to the office of the Department of Buildings or which are required by law to be filed therein. He shall perform such other duties as may be required of him by the Commissioner of Buildings
- 225. Clerical Assistants.) The Commissioner of Buildings shall appoint according to law, such clerical assistants, stenographers and messengers as may be necessary; and they shall perform such duties as may be required of them by the Commissioner of Buildings.
- 226. Bonds.) The Deputy Commissioner of Buildings, the Engineer in Charge, the Assistant Engineer in Charge, the Building Inspector in Charge, the Assistant Building Inspectors in Charge, the Elevator Inspector in Charge, the Fire-escape Inspector in Charge and the Architectural Engineers shall, before entering upon the duties of their offices or positions, each execute to the City of Chicago a bond, conditioned for the faithful performance of their duties, with such surcties as the City Council shall

- approve in the following sums: The Deputy Commissioner of Buildings, ten thousand dollars; the Engineer in Charge, the Assistant Engineer in Charge, the Building Inspector in Charge, the Assistant Building Inspectors in Charge, the Elevator Inspector in Charge, the Fire-escape Inspector in Charge, and the Architectural Engineers, five thousand dollars each.
- 227. Employees Not to Engage in Another Business.) Every employee in the Department of Buildings shall devote his entire time to such employment and shall not be engaged in any other business or vocation.
- 228. Power of Entry.) The Commissioner of Buildings and his Assistants are empowered to enter any building or structure or premises, whether completed or in process of erection, for the purpose of determining whether the same has been or is being constructed and maintained in accordance with the provisions of this chapter and it shall be unlawful to exclude them from any such building, structure or premises.

#### ARTICLE II.

- 229. Permits—When Required—Limitations of Time For.) Before proceeding with the erection, enlargement, alteration, repair or removal of any building or structure in the city, a permit for such erection, enlargement, alteration, repair or removal shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the erection, enlargement, alteration, repair or removal of any building or of any structural part thereof within the city unless such permit shall first have been obtained from the Commissioner of Buildings. And if after such permit shall have been granted, the operations called for by the said permit shall not be begun within six months after the date thereof, or if such operations are not completed within a reasonable time then such permit shall be void, and no operations thereunder shall be begun or completed until an extended permit shall be taken out by the owner or his agent, and a fee of ten per cent, of the original cost of permit shall be charged for such extended permit.
- \*°230. Permits - Application For - How \*2:30. Permits—Application For—How Made—How Recorded—Stamped Plans—How Cared For—Return of Same.) (a) Application for building permits shall be made by the owner or his agent to the Commissioner of Buildings. When such application is made, plans in conformity with the prois made, plans in conformity with the provisions of this chapter, which have been examined and approved by the Commissioner of Buildings and his assistants, as hereinafter provided for shall be filed with the Commissioner of Buildings. He shall the Commissioner of Buildings. He shall then issue a permit, and shall file such application, and shall apply to such plans a final official stamp, stating that the drawings to which the same has been applied comply with the terms of this chapter. The plans so stamped shall then be returned to such applicant. True copies of so much of such plans as may be required in the opinion Commissioner of Buildings to illustrate the features of construction and equipment of the building referred to, shall be filed with the Commissioner of Buildings, and shall remain on file in his office for a period of six months after the occupation of such building, after which such drawings shall be returned by the Commissioner of Buildings to the person by whom they have been deposited with him, upon demand. It shall not be obligatory upon the Commissioner of Buildings to retain such drawings in his custody for more than six months after the occupation of the building to which they relate.

(b) All plans and drawings for the construction or alteration of any building or other structure for which building permits are required shall, before such permits are issued, be presented to the Commissioner of Health for examination and approval as to the proposed plan for the ventilation of rooms, light and air shafts, windows, the ventilation of water closets, drainage and plumbing. They shall also be presented to the Fire Marshal for approval as to standpipes and all fire-fighting apparatus, where same are required. They shall also be presented to the Boiler Inspector and Smoke Inspector in all cases where permits from these departments are required to be procured by the ordinances of the city.

The Commissioner of Buildings shall (e) not issue any permit authorizing the connot issue any permit authorizing the construction, erection, repair or alteration of any building or structure unless the plans submitted for his approval clearly show that such building or structure with all its appurtenances, foundations and attachments can be erected entirely within the limits of the lot or tract of land upon which it is proposed to erect such building or structure, except as provided by the ordinances of the City of Chicago, and no permit to erect, repair or alter any building or structure shall pair or after any bunding or structure snan authorize the use of any part of any public highway or other public ground for the construction or maintenance of such building or structure except as provided by the ordinances of the City of Chicago, nor shall any permit be issued for the construction or maintenance of any balcony or canopy extending over any public highway or other multiple ground any large promits theorem have public ground unless permits therefor have been obtained from the proper department of the city government pursuant to an ordinance specifically authorizing the same. The plans of every building or structure which show that any part of said building or structure, or any of its appurtenances, or any attachments thereto, extend over any any attachments thereto, extend over any part of any public highway or other public ground shall first be submitted to the Commissioner of Public Works and notice thereby given to him of the proposed encroachment upon any public highway or other public ground. Proof of such notice to the Commissioner of Public Works must be presented to the Commissioner of Building before a permit for any such building ings before a permit for any such building or structure shall be issued by said Comor structure shall be issued by said commissioner of Buildings; and no permit issued by the Commissioner of Buildings shall authorize any encroachment upon any part of any public highway or other public ground. \*Amended December 12, 1910

(d) In all cases, the approved plan, together with building permits, must be kept on the job while the work is in progress.

231. Plans—Essentials Of.) All such plans and drawings shall be drawn to a scale of not less than one-eighth of an inch to the foot, on paper or cloth, in ink, or by some process that will not fade or obliterate. All distances and dimensions shall be accurately figured, and drawings made explicit and complete, showing the lot lines and the entire sewerage and drain pipes and the location of all plumbing fixtures within such building. Each set of plans presented shall be approved by the Commissioner of Buildings before a permit will be granted. No permit shall be granted or plans approved unless such plans are signed and sealed by a licensed architect, as provided in "An Act to provide for the licensing of architects and regulating the practice of architecture as a profession in the State of Illinois," approved June 3, 1897.

232. Plans—Alterations Upon Stamped Plans Not Permitted Without Permission—Certain Alterations Excepted.) It shall be unlawful to erase, alter or modify any lines, figures, or coloring contained upon such

drawings so stamped by the Commissioner of Buildings or filed with him for reference. If, during the progress of the execution of such work, it is desired to deviate in any manner affecting the construction or other essentials of the building from the terms of the application, or drawing, notice of such intention to alter or deviate shall be given to the Commissioner of Buildings, and his written assent shall first be obtained before such alteration or deviation may be made; but alterations in buildings which do not involve any change in their structural parts or of their stairways, elevators, fire-escapes or other means of communication or ingress or egress or in lighting or ventilation and that are not in violation of any of the provisions of this chapter, may be made without the permission of the Commissioner of Buildings.

233. Deposit With Water Department—
How Made—Indemnifying Bonds—Fees for Water Used.) (a) Before the Commissioner of Buildings issues a permit as aforesaid he shall require evidence from the applicant that payment has been made to the Bureau of Water of the city for the water to be used or for a water meter for measuring all the water to be used in the construction of such building, under the regulations of the Bureau of Water. Such applicant shall produce evidence that he has filed with and had approved by the Commissioner of Public Works of the city an indemnifying bond protecting the city against any and all damage that may arise to the streets or alleys upon which such building abuts, and to the city and to any person in consequence, or by reason of, the proposed operations to be authorized by such permit, or by reason of any obstruction or occupation of any street or sidewalk in and about such building operations.

(b) The fees to be paid for water used in connection with the erection of buildings

shall be as follows, to-wit:

At the rate of five cents for every one thousand bricks, wall measure, used in connection therewith.

nection therewith.

At the rate of six cents for every one hundred cubic feet of rubble stone used in

connection therewith.

At the rate of eight cents for every one hundred cubic feet of concrete used in connection therewith.

At the rate of fifteen cents for every one hundred yards of plastering used in con-

nection therewith.

At the rate of five cents for every one hundred cubic feet of hollow tile arch, partition or fireproof covering used in connection therewith.

\*234 Amount of Permit Fees.) (a) The fees to be charged for building permits shall be as follows: For sheds not exceeding three hundred square feet in area. Two Dollars; for open shelter sheds, at the rate of Fifty Cents for each one thousand cubic feet or fractional part thereof; for all buildings or other structures, other than sheds and open shelter sheds, as hereinafter described, the fee for the permit shall be at the rate of Ten Cents for every one thousand cubic feet or fractional part thereof contained therein, the cubic contents being measured to include every part of the building from the basement floor to the highest point of the roof, and to include all bay windows and other projections; but in no case, shall any permit be issued for a less fee than Two Dollars, except that a fee of One Dollar shall be charged for recovering or recoating the roof of any building.

fee than Two Pollars, except that a fee of One Dollar shall be charged for recovering or recoating the roof of any building.

(b) The fee to be charged for permits issued for alterations and repairs in or to any building or other structure shall be based on the cost of such alterations and repairs and shall be at the rate of Two Dollars for each Five Thousand Dollars or

Part thereof to be expended therefor. The fee for permit to raise any building other than a frame building shall be Two Dollars for every twenty-five feet or fractional part thereof of frontage.

(c) In addition to the above permit fees for buildings, fermit and inspection fee shall be charged as follows:

charged as follows:
For creetiin of fire escapes, \$2.00;
For installation or alteration of elevator, \$2.00;
For semi-annual inspection of elevator, \$2.00;
For erection of bilboard or sign-boord, \$2.00 for every 25 lineal feet or fractional part thereof;
For annual inspection of billboard or signboard, 35 cents for each 25 lineal feet of billboard or signboard or fractional part thereof; or crection of illuminated and other roof signs

under Section of illuminated and other roof sights under Section 710 of this Chapter, \$50.00 for the first 500 square feet of superficial area or frac-tional part thereof, and two cents for each ad-ditional square foot area. For annual inspection of illuminated and other

roof signs under Section 710 of this Chapter,

\$50.00:

For tearing down or wrecking a building, \$2.00 for every 25 feet of frontage or fractional part thereof:

For annual inspection of building required to be inspected by Section 237 of this Chapter, \$2.00 for each 23.000 square feet or fractional part

For semi-annual inspection of iron or steel curtain, \$5.00,

For semi-annual inspection of asbestos curtain, \$2.00:

For permit for tank or tower on roof in excess of 500-gallon capacity, \$5.00;
For permit for isolated chimneys or for chimneys extending over fifty feet above the roof of any building, \$5.00.

\*Amended February 20, 1911.

235. Permit for Wrecking Building.) (a) Before proceeding with the wrecking or tearing down of any building or other structure more than one story in height or of any structure of greater area than 2,800 square feet, a permit for such wrecking or tearing down shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the wrecking or tearing down of any building or structure or any struc-tural part of such building or structure unless such permit shall first have been obtained. Application for such permit shall be made by such owner or his agent to the Commissioner of Buildings who shall issue such permit upon such application and the payment of the fee herein provided for. Such application shall state the location and lescribe the building which it is proposed to wreck or tear down. The fee for such permit shall be Two Dollars for every twenty-five feet, or fractional part thereof, of frontage. Upon the issuance of such permit, such building may be wrecked or torn down, provided that all the work done thereunder shall be subject to the super-vision of the Commissioner of Buildings and to such reasonable restrictions as he may impose in regard to elements of safety and health, and provided, further, that the work shall be kept sprinkled and sufficient scaffolding be provided to insure safety human life.

(b) Any person, firm or corporation engaged in the wrecking of a building or other structure for which a permit is required, shall file with the City Clerk a bond with sureties satisfactory to the City Comptroller in the sum of Twenty Thousand to indemnify the City against any Dollars. law suits brought or judgments obtained against the City of Chicago or any of its officials, resulting from accidents to persons or property during wrecking operations, and no permit shall be issued for any wrecking work except as hereinabove otherwise provided, until such bond is filed.

\*226 Permit—Revocation of.) If the work in, upon or about any building or structure shall be conducted in violation of any of the provisions of this chapter, it sholl be the duty of the Comthe build ng or wrecking operations in connection with which such violation shall have taken It shall be unlawful, after the revocation such permit, to proceed with such building or wrecking oferations unless such permit shall first have been re-instated or re-issued by the Com-missioner of Buildings. Before a permit so re-voked may be lawfully re-issued or re-instated, the entire building and building site shall first be put into condition corresponding with the requirements of this chapter, and any work or ma-terial applied to the same in violation of any of the processors of this chapter shall be first re-moved from such buildings.

\*Amended February 20, 1911.

\* 227. Annual Inspection of Buildings— Stairways and Means of Egress—Inspection The Commissioner of Buildings Fee.) (a) and his assistants shall make an annual inspection of all theatres and places of amusement, worship, instruction or entertainment, and also of other buildings over two stories in height, except residences, and except tenements three stories or less in height. It shall be the duty of every owner, agent, lessee or occupant of any such building as is referred to in this section and of the person in charge or control of the same to perthe making of such annual inspection by the Commissioner of Buildings, or by a duly authorized Building Inspector, at any time upon demand being duly made.

Whenever any such inspection shows (b) the building to be in compliance with the requirements of this Chapter with to stairways, means of egress, and in all other respects, it shall be the duty of the Commissioner of Buildings to issue, or cause to be issued, a certificate setting forth the result of such inspection, containing the date thereof, and a statement to the effect that such building complies in all respects with the provisions of this Chapter, upon the payment of the inspection fee herein re-

quired.

(c) It shall be the joint and several duty of the owner, agent, lessee or occupant of the building so inspected and of each and every person in charge and control of the same to frame the said certificate and place it in a conspicuous place near the main entrance of such building.

(d) It shall be the joint and several duty of the owner, agent, lessee or occupant of every building described in this section to provide a typical floor plan of such building reproduced on a sheet eight by ten inches in size. Said plan shall be drawn on as sheet, and said sheet shall also state the street address of such building, and shall give the class of the building, the kind of the number of stories contained therein, the nature of the occupancy, and whether said building is equipped with an approved automatic sprinkler system.

(e) It shall also be the joint and several duty of such owner, agent, lessee or occu-pant to deliver a copy of said sheet to the Commissioner of Buildings and to frame a copy of said sheet and place the same near

copy of said sheet and place the same near the framed certificate hereinabove required. (f) It shall also be the joint and several duty of the said owner, agent, lessee or occupant to substitute a new sheet for the sheet on file with the Commissioner of Buildings, and also the sheet framed as above required, whenever such changes or alterations are made in such building as will affect the substantial accuracy of the sheet previously furnished such Commissioner and framed as above required. (g) Where the result of such inspection shall show that such building fails in any

shall show that such building fails in any

respect to comply with the requirements of this Chapter, it shall be the duty of the Commissioner of buildings to notify the owner, agent, lessee or occupant of such building to this effect and to specify wherein building to this effect and to specify wherein such building fails to comply with the requirements of this chapter; and it shall thereupon become the joint and several duty of such owner, agent, lessee or occupant to proceed forthwith to make whatever changes or alterations may be necessary to make such building comply in all respects with the requirements of this chapter and to complete such shapes and observations within complete such changes and alterations within thirty days after the receipt of such notice.

(h) Upon making such annual inspection, it shall be the duty of the owner to pay to the City Collector an annual inspection fee for the same, amounting to \$2.00 for each 25,000 square feet of floor area, or fractional part thereof: Provided however that no charge for such annual inspection shall be made against religious, charitable or educational institutions tions.

Amended December 11, 1911,

238. Architect Must Certify That Plans Comply With the Building Ordinances.) It shall be unlawful for any architect, or other person permitted under the laws of the state to make plans, to prepare or sub-mit to the Commissioner of Buildings for his approval any final plans for any building or structure which do not comply with the structural requirements of this chapter. It shall be the duty of the Commissioner of Buildings to require that all plans submitted to him for approval for any building or structure shall be accompanied by a certificate of such architect or such other person preparing such plans that the plans submitted comply with the structural requiraments of this chapter.

Constructing Buildings Contrary to

Approved Plans—Permit Made Void by Deviation from Plans—Power to Stop Work.)

(a) It shall be unlawful for any owner, agent or architect or for any contractor or builder engaged in erecting, altering or repairing any building, to make any departure from the plans as approved by the Commissioner of Buildings of such nature that such departure involves any violation of the requiresuch departure involves any volation of the require-ments of this chapter as to build nes of the class in which such building is, or to make any changes in plans or construction affecting means of egress, ventilation, natural lighting, or sanitary conditions without first obtaining the written consent of the Commissioner of Buildings and of the Commissioner of Health to such changes. Any such departure from the approved plans involving a violation of the requirements of this chapter or any such change in the plans or construction without the consent of in the plans or construction we thout the consent of the Commissioner of Buildings and of the Commisscience of Barta ago and of the Commis-science of Health being obtained, as required herein, small operate to annul the permit which has been issued for such work and shall render the same

(b) In case any work is done under a permit authorizing the erection, alterotion or repair of a building or structure, which work is contrary to the approved plans, the Commissioner of Buildings or the Commissioner of Health and their assistants shall have power to at once stop such work and to order all persons engaged therein to stop and desirt therefrom. Such work shall but he resumed desist therefrom. Such work shall not be resumed until satisfactory assurance has been given the Commiss oner of Buldings or the Commissioner of Health that it will be done according to the ap-proved plans or until said Commissioner of Build-ings or Commissioner of Health has consented, in writing, to the changes made in such approved plans, in either of which cases a new permit must be issued before the work proceeds, for which permit the usual fee shall be pa'd by the contractor doing such work.

(c) No contractor or builder shall begin any work on any building or structure for which a permit is required until such permit shall have been secured. In case any work is begun on the erection, alteration, repair or removal of any building or structure without a permit authorizing the same being issued therefor, the Commissioner of Build-ings and his assistants shall have power to at once stop such work and to order any and all persons engaged therein to stop and desist therefrom until the proper permit is secured.

\*Amended July 22, 1912.

#### ARTICLE III.

Classification of Buildings.

\*240 Buildings-Class Of.) All (a) buildings other than sheds and shelter sheds as hereafter described, now existing or hereafter erected, altered or enlarged, shall be classified as follows:

assified as follows:
(b) Class I.) In Class I shall be included every building other than department stores as described in this chapter, used for the sale, storage, or manufacture of merchandise, and every stable or garage having a ground area of 500 square feet or over.

\*Amended February 20, 1911.

(c) Class II.) In Class II shall be included every building referred to in subdivisions Class IIa, Class IIb and Class IIc.

- (d) In Class IIa shall be included every building used for office purposes, and also every building used for club house purposes where sleeping accommodations are provided for less than twenty persons.
- In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.
- In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles or children. and every jail, police station, asylum, house of correction and detention, and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.
- (g) Class III.) In Class III shall be included every building used as a family residence, and also every building used for garage or stabling purposes, and having a ground area of less than 500 square feet.
- (h) Class IV.) In Class IV shall be included every building referred to in subdivisions Class IVa, Class IVb, Class IVc, and Class IVd, as follows:
- In Class IVa shall be included every building used as a church or place of wor-
- (j) In Class IVb shall be included every building having a parish hall, Lodge ball dance hall, banquet hall, skating rink, as-Lodge hall sembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction other than schools, included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVe, IVd, and V.
- (k) In Class IVc shall be included every building hereafter erected used for moving picture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, and where the seating capacity does not exceed three hundred, provided, that every building of Class IVc existing at the time of the passage of this ordinance shall comply with the provisions of Class IVb.
- (1) In Class IVd shall be included every grand stand and every baseball athletic and amusement park.
- (m) Class V.) In Class V shall be included every building which is used as a public theatre where an admission fee is charged and in which movable scenery is used, and every assembly hall hereafter erected having a seating capacity of over

300 and containing a permanent stage on which scenery and theatrical apparatus are used and regular theatrical vaudeville per-tormances are given; provided, however, that public halls and club halls with a seating capacity of less than 600, although occasionally used for theatrical presentations, snall not be construed to be public theatres within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stages thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V as herein defined. Such public halls and club halls shall be included in Class IVb, as defined in this section.

(n) Class VI.) In Class VI shall be included every tenement and apartment house or building or portion thereof which is used or intended to be used as a home or resi-dence for two or more families living in separate apartments.

(o) Class VII.) In Class VII shall be included every building used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as a department store.

(p) Class VIII.) In Class VIII shall be included every building used for school purposes having a seating capacity of more than 100 students.

(q) Requirements with regard to buildings not within any of the above classes shall be determined by the Commissioner of Buildings, subject to arbitration in the same as provided in Sections 206 and manner 207 of this chapter.

- 241. Buildings Used for the Purposes of More Than One Class.) Where any building is used for the purposes of two or more classes, as herein specified, and defined, such portion of any such building as is devoted to the uses and purposes of any particular class shall be constructed, operated and operated and maintained in accordance with the requirements of this chapter relating to such class, unless such construction shall, in the opinion of the Commissioner of Buildings, prove impracticable, or unless there would be a conflict between the provisions of this chapter relating to the construction of buildings. m either of which cases the provisions which relate to and govern the construction of buildings of the class requiring the best and safest form of construction shall govern the entire building.
- 242. Conflict Between Special and General Provisions.) Whenever any provision or requirement of this chapter relating specifically to the construction, equipment, maintenance, or operation of any building or part of a building used for the purposes of any specified class, shall conflict with the general provisions of this chapter relating to the construction, equipment, maintenance and operation of buildings generally, the special provisions shall govern in each case, except in the case of Section 514, which shall govern in all cases coming within the provisions.

#### ARTICLE IV.

## Class I.

Class I Defined.) In Class I shall be \*Anonded Pebruary 20, 1911.

24314. Must Comply With General and Special Provisions.) Every building of Class I shall comply with the general provisions of this chapter, and shall, in addition, comply with the following special provisions:

244. Buildings—Construction of—In Relation to Height.) (a) The construction of buildings of Class I shall be as follows Buildings of Class I which are more than 90 feet in height shall be built of fireproof construction.

(b) Buildings of Class I which are less than 90 feet in height and more than 50 feet in height shall be built of slow-burning,

mill or fireproof construction.

(c) Buildings of Class I of ordinary construction shall not be built more than four

stories in height. stories in height.

\*245. Skeleton Steel Walls—Metal Lath
and Solid Cement Plaster Covers.) (a) A
one or two story building used for the purposes of Class I, no part of which is within
twenty feet of any lot line, alley line or
street line, having a complete self-support ing steel frame consisting of wall columns. supporting steel trusses, with steel trusses and steel diagonals, designed to resist safely, within the safe limits of stress provided by this chapter, a wind pressure of twenty pounds per square foot, for each and every exterior surface exposed to the wind, iv exterior surface exposed to the wind, in addition to the dead weight of the completed structure, and in addition to the live load of 100 pounds per square foot provided for by this chapter, and any other live loads which may be imposed on such structure. may have exterior walls measuring not less than one and one-third inches thick of meta) than one and one-third inches thick of metal lath or metal fabric plastered on both sides with a mortar consisting only of Portland cement and torpedo sand. Complete remember of concrete framework, built in every manner equally as strong and as safe as provided for a steel frame, in this section, may have exterior walls built in the same manner, of the same materials and of the same thickness.

same thickness. (b) The enclosing walls of buildings which are built not less than fifty feet from any lot, alley or street line, may be constructed of corrugoted iron, supported on a steel frame built as specified in this section.
Amended February 20, 1911.

\*246. Door Openings—Revolving Doors.)
(a) The aggregate width of door openings at the street level in buildings of Class I shall be equal to the aggregate width of stairways, as specified in Section 666 of this chapter, and all locks used on exit doors or on doors or gates leading to hallways or on goors or gates leading to nailways which lead to exit doors, shall be so arranged that they may be opened from the inside without the use of a key, during business hours, or while such buildings are occupied for any purpose. In every building of this class, every door leading ings are occupied for any purpose. In every building of this class, every door leading from a loft or space above the first story shall swing into the stair hall, and every door which is a means of exit from any floor above the first, shall swing outwardly from the space or hallway in which said stairway from such upper floor is located No door when open shall project over a public sidewalk.

(b) Revolving doors shall not be considered as complying with this section unless the recovering wings of such revolving doors are so arranged that, by the application of a force slightly ranged that, by the application of a force signifi-more than is necessary to recover said doors and which one person of ordinary strength is capu-ble of exerting, all the wings of said doors fold that on each other and in an outward direction. or unless the revolving wings of said revolving aoors are so arranged that they may be readily acors are so arranged that they may collarsed or removed by pressure or simple mecollapsed or removed by pressure or simple mechanical means, to be approved by the Commissioner of Buildings, and leave sufficient opening for two or more persons to pass through with a minimum width of not less than 22 inches on each side of said collapsed doors.

Where revolving doors are used as exits they shall be credited as exits only to the extent of the clarer space remaining when the doors are

the clear space remaining when the doors are collapsed, and all deficiency of required exits must be made up by additional doors.

\*Amended February 20, 1911.

247. Existing Buildings of Class I—Increasing Height of.) In all cases where buildings of Class I of ordinary construction built prior to the passage of this ordinance, are to be increased in height above the height of fifty feet, or of mill or slowburning construction above the height of ninety feet, the additional parts of such buildings shall be constructed as herein provided for buildings over fifty feet in height or over ninety feet in height, respectively, and said additional parts shall be made to conform in all respects to the requirements for buildings of this class more than fifty feet in height or more than ninety feet in height, respectively, before it shall be lawful to occupy them.

248. Ceiling and Roof—Space Between.) In buildings of Class I, if the enclosed space between a ceiling and the roof is of greater average height than two feet, access shall be provided by means of at least one stairway not less than three feet wide, leading from a public hallway or corridor.

249. Fire Walls.) (a) Buildings occupied by more than one person, firm or corporation, or for more than one business enterprise conducted by the same person, firm or corporation, in separate enclosures on any one floor, shall have a brick dividing wall for every fifty feet of street frontage, if of ordinary construction, or for every eighty feet of street frontage, if of slow-burning or mill construction, and such dividing walls shall extend from the front to the rear wall and such dividing walls and the doors therein shall be built in accordance with the provisions of Section 573 of this chapter.

(b) All of the partitions between the parts of such buildings occupied by different persons, firms or corporations, shall be built of incombustible material from the floor to the floor boards or roof boards next above such story or stories so occupied.

(c) Only metal framed windows glazed with one-quarter inch thick wire glass may be used in such partitions.

Dividing Walls-When Required.) Dividing walls will be required in

buildings of Class I as follows:

(b) Every building of ordinary construcgreater area than 9,000 square tion having tion naving greater area than 3,000 square feet shall be divided into areas of 9,000 square feet or less by dividing walls; every building of slow-burning or mill construc-tion more than one story in height, having a floor area greater than 12,000 square feet shall be divided into areas of 12,000 square fect or less by dividing walls; every fireproof building more than two stories in height having a floor area greater than 30,000 square feet shall be divided into areas of 30,000 square feet or less by dividing walls.

(c) Where dividing walls are required in any of the above mentioned buildings, such building shall be subdivided by brick walls, built of the thickness given in the table for the thickness of englesing walls. table for the thickness of enclosing walls and all doors or other openings in such walls shall have at each side of the same, iron doors, tin clad doors or shutters, as de-scribed in Section 573 of this chapter, and said buildings as subdivided shall be prosaid buildings as subdivided shall be provided with stairs and fire escapes the same as hereinafter required; provided, however, that one-story buildings of ordinary mill or slow-burning construction and two-story buildings of fireproof construction of any size when used as one store, room or workshop and occupied by only one person firm or cornogation may be erected. person, firm or corporation, may be erected without any dividing walls.

\*251. Display of Placard—Indicating Floor Strength.) (a) It shall be the duty of the owner of every building of Class I now in existence or hereafter erected, or

of his agent, or of the occupant, or person in possession, charge or control of same, to possession, affix and display conspicuously on each floor of such building, a placard, stating the uni-formly distributed load per square foot of floor surface, which may with safety be apfloor surface, which may with safety be applied to that particular floor, as provided by this chapter, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any strength there or returned there are there to a very the strength of the surents. such floors or any part thereof to a greater extent than the loads indicated upon such placards.

(b) It shall be the duty of the occu-pants of such buildings to maintain such placards during their occupation of the premises and of the owners of buildings, or their agents, to cause the same to be prop-erly affixed with each change of occupation. It shall be the duty of the owner, agent or lessee of each such building, now in existence, as well as of cath such contact, to procure and submit evidence of the correctness of the figures on such placards to the Commissioner of Buildings. Whenever such evidence as to the correctness of the figures shall be satisfactory to the Commissioner of Buildings, he be satisfactory to the Comm skioner of Buildings, he shall approve such placards. Such placards so approved by the Commissioner of Buildings shall then be affixed upon the respective floors of the different buildings. The calculations and loads shall be in accordance with the provisions of this chapter.

(c) For buildings now in existence, it shall be the duty of the owner, agent or lessee to pay to the City Collector a fee amounting to five dollars (\$\$.00) for each fifty thousand (\$0.00) square feet of floor area, or fractional part thereof for each of floor area, or fractional part thereof for e building for which such placards are approved.

\*Amended December 4, 1911.

\*252. Live Loads for Floors.) The floors of all buildings of Class 1 hereafter creeted shall be designed and constructed in such a manner as to be capable of bearing, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface, and the strength of such building shall be increased above the capac-ity to carry such a live load of one hundred pounds per square foot of floor surface, when the uses to which such building, or part thereof, is to be applied, involve greater stress. The calculations and loads shall be stress. The calculations and loads shall be in accordance with the provisions of this chapter. In every building of Class I now constructed and in use, whenever it shall be found by the Commissioner of Buildings that the floors of same, or any part or parts thereof, are not capable of bearing, in addition to the weight of the floor construction, partitions, permanent fixtures and mechanisms that may be upon the same, a live load of forty pounds for every square foot of surface, he shall condemn the same and order such floor or floors to be repaired or reconstructed within a reasonable time by the owner or occubant within a reasonable time by the owner or occupant thereof, and shall proceed in the manner prescribed in sections 201 and 202 of The Chicago Code of 1911, and in such case it shall be unlawful for the owner or occupant to continue to use such building until the said floors shall be repaired or reconstructed in accordance herewith.

\*Amended November 13, 1911.

253. Elevator Buildings.) Elevator buildings intended solely for the receipt, storage and delivery of grain in bulk, shall be of fireproof construction as described in this chapter.

## ARTICLE V.

Class II.

254. Class II Defined.) (a) In Class II shall be included every building referred to in subdivisions Class IIa, Class IIb and Class He.

In Class IIa shall be included every (b) building used for office purposes, and also every building used for clubhouse purposes where sleeping accommodations are provided for less than twenty persons.

- (c) In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.
- (d) In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles, or children, and every jail, police station, asylum, house of correction and detention, and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.
- 254½. Must Comply With General and Special Provisions.) Every building of Class II shall comply with the general provisions of this chapter, and in addition to the general provisions shall comply with the following special provisions:
- 255. Allowance for Live Loads in Construction of Floors of Class II.) For all buildings of Class II the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of fifty pounds for every square foot of surface, and such live load shall be computed in accordance with the provisions of this chapter.
- 256. Windows and Mechanical Ventilation.) (a) In every building hereafter erected for or converted to the purposes of this class, courts shall be of the minimum widths and areas prescribed in Section 442 of this chapter, and vent shafts as defined in Section 432 of this chapter, shall be of the following minimum width and areas:

Η	eight of	Least Width		Square
	Shaft.	in Feet.		Feet.
1	story .			$^{21}$
2	stories	3		$22\frac{1}{2}$
3	stories	3		$^{27}$
4	stories	3		36
5	stories	5		48
6	stories	6		72
7	stories	8	,	96
8	or more	stories 8		120

- (b) In every building hereafter erected for or converted to the purposes of this class, every room used as a private sitting room or as a sleeping room, shall have at least one window which opens directly upon a street, alley, yard or court. The total glass area of such window or windows opening directly upon a street, alley, yard or court shall be not less than one-tenth of the floor area of such room. The top of at least one area of such room. The top of at least one such window shall be at least seven feet above the floor and at least the upper half of such window shall be capable of being opened. No such window shall have a glass opened. No such window snan nave a game area of less than ten square feet unless it window in excess of the one-tenth of the floor area as required by this paragraph. Provided that sleeping cells in prisons, jails, police stations and houses of detention need not have each a window opening directly on a street, alley, yard or court if such cells are in a cell block which has windows with a glass area equal to one-fourth of the floor area of such block and arranged so that each window may be opened for one-half of its area, and provided further that such cell block and cells shall be equipped with a system of mechanical ventilation approved by the Commissioner of Health.
- (c) In every building hereafter erected for or converted to the purposes of this class, every pantry, bath room and water closet and urinal compartment shall have at least one window which opens directly upon a street, alley, yard, court or vent shaft; the total glass area of such window or windows opening directly upon a street, alley, yard, court or vent shaft shall be not less

than one-tenth of the floor area of such room or compartment. The top of at least one such window shall be at least seven feet above the floor and at least the upper half of such window shall be capable of being opened; and no such window shall have a glass area of less than six square teet or a glass width of less than one foot; provided, however, that such room or compartment, if located in the upper story of any such building, may be lighted and ventilated by means of a skylight having a glass area equal to one-tenth of the floor area of the room it serves and be equipped with an effective area to one-twentieth of the floor area of such room; and provided further, that any such room or compartment in a building used for office, club or hotel purposes, in lieu of such window or windows, may be ventilated by an approved mechanical ventilation system which shall effect at least six complete changes of air per hour.

(d) In every building hereafter erected for or converted to office, hotel or club purposes, every room, except a room used as a bakery, which is below street grade and which is frequented by the public or in which there are regularly employed five or more persons, shall be ventilated by an approved mechanical ventilating system which shall effect at least six complete changes of air per hour; provided that in case of store rooms below street grade having 1,500 cubic feet of space per person employed therein two changes of air per hour will be deemed sufficient. In buildings of this class every room, either above or below grade, used as a bakery, shall comply with the provisions of the ordinances of the City of Chicago in respect to bakeries.

(e) In every building hereafter erected for or converted to the purposes of this class, every room not otherwise specifically provided for in this section shall, where practicable, have a window or windows, with a total glass area not less than one-tenth of the floor area of such room, opening-directly onto a street, alley, yard or court, and no such window shall have a width of less than one foot or a total glass area of less than ten square feet, unless such window is in excess of the ten per cent of floor area requirement; provided that, if it be impracticable to ventilate any such room by windows as aforesaid, such rooms shall be ventilated by an approved mechanical ventilating system which shall effect at least six complete changes of air per hour; the air supply being taken from the outer air at a point not less than ten feet above the street level.

(f) It shall be the duty of the owner, agent, architect, or party in possession or control of any building in which a mechanisystem of ventilation shall have been installed under the requirements of this section, upon completion of such system, to notify the Commissioner of Health in writing at least twenty-four hours in advance of the making of a test of such system; and each such system or unit shall be tested for volumetric efficiency by the owner or his representative in the presence of the representative of the Commissioner of Health and such system shall not be considered as meeting the requirements of this section until shall have been approved by the Commissioner of Health. Every such mechanical ventilating system shall at all imes be kept in good repair and in operation so as to insure the required ventilation of all rooms and compartments planned to be venall tilated thereby, during all hours of human accupancy.

Class IIa.

257. Class IIa Defined.) In Class IIa shall be included every building used for office purposes, and also every building used

for club house purposes where sleeping accommodations are provided for less than twenty persons.

258. Buildings—Construction of—Height of.) (a) Buildings of Class IIa which are ninety feet or more in height shall be built entirely of fireproof construction.

(b) Buildings of Class IIa less than ninety feet and more than fifty feet in height shall be built either of slow-burning, mill or fireproof construction.

(c) Buildings of Class IIa not exceeding fifty feet in height may be built of ordinary construction.

Class IIb.

25.9. Class IIb Defined.) In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.

260. Buildings—Construction of—Height of.) (a) Buildings of Class IIb more than five stories and basement high shall be of fireproof construction.

(b) Buildings of Class IIb more than three stories and basement high but not more than five stories and basement high shall be of slow-burning or fireproof construction. In case slow-burning construction be required the cellar and basement construction, including the floor construction of the first story above the cellar or basement, shall be of fireproof construction.

261. Walls—Divisions and Partitions— Fire Stops.) (a) In buildings hereafter erected used wholly, or in part for the purposes of Class IIb of ordinary, slow-burning or mill construction, there shall be for every eight rooms in any one story, dividing walls or partitions of incombustible material separating such eight rooms from the contiguous spaces.

(b) In all buildings hereafter erected to be used wholly or in part for the purposes of Class IIb, all elevators and stairs shall be enclosed in partitions of incombustible or fireproof material, and the partitions of all corridors leading to such elevators and stairs shall be of fireproof or incombustible material. Such partitions shall be carried on self-supporting masonry or a framework of steel or iron. Where glass is used in said partitions, the same shall be wired glass set in metal frames but such glass shall not exceed sixty per centum of the superficial area of said partitions.

(c) In all non-fireproof buildings of Class Ilb there shall be between joists a stop of brick, concrete or tile not less than four inches in thickness, extending the full height of joists and spaced not more than twenty-five feet apart, measured in the di-

rection of the length of the joist.

262. Sleeping Stalls in Rooms—When Allowed.) Sleeping stalls shall not be constructed or used in any room in any building now existing or hereafter erected and devoted, in whole or in part, to the purposes of a lodging or rooming house unless such room has two or more windows which open directly upon a street, alley, yard or court and which windows have a total area equal to at least one-tenth of the floor area of such room, nor unless the semi-partitions forming such stalls are so constructed that there is a clear and unobstructed interval of at least thirty inches between the top of such semi-partitions and the ceiling of the room, nor unless each such stall shall open directly into an aisle or passageway leading directly to a stairway or stairway fire escape, the location of which is indicated by a red sign and at night by a red light also. Such sleeping stalls shall not be installed in any such room in such numbers that there shall be less than 400 cubic feet of air per person when all stalls are occupied to their

full capacity. The semi-partitions forming such stalls hereafter constructed shall be of incombustible material.

#### Class Hc.

263. Class IIc Defined.) In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles or children and also every jail, police statu.n, asylum, house of correction and detention and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.

# \*264. Buildings—Construction of—Height of.)

(a) All buildings of Class IIc more than two stories in height hereafter erected for or converted to the purposes of Class IIe shall be of fireproof construction except that buildings erected for or converted to the use of police stations for temporary purposes may be of mill or slow burning construction."

\*Amended May 15, 1911.

(b) Buildings of Class IIc not more than two stories in height may be of ordinary, mill or slow-burning construction.

265. Frontage Consents for Hospitals.) It shall be unlawful for any person, firm or corporation to build, construct, maintain, conduct or manage in any block in which two-thirds of the buildings fronting on both sides of the street or streets on which the proposed hospital may front are devoted to exclusive residence purposes, any hospital unless the owners of a majority of the frontage in such block and the owners of a majority of the frontage in such block and the owners of a majority of the frontage on the opposite side or sides of the street or streets on which said building faces consent in writing to the building, constructing or maintaining, managing or conducting of any such hospital in said block. Such written consents of the majority of said property owners shall be filled with the Commissioner of the building or constructing, or a license be issued for the maintaining, conducting or managing of any such hospital.

266. Coves in Rooms and Corridors of Hospitals.) In every building hereafter constructed for or converted to hospital purposes, in all corridors and rooms used by patients, all intersections of walls, floors and ceilings shall be formed with tangent coves.

267. Elevators in Hospitals.) Every building over three stories in height hereafter constructed for or converted to hospital purposes shall have at least one elevator, the floor dimensions of which shall be not less than seven feet by five feet, and said elevator shall be enclosed in a fireproof shaft with incombustible doors closing off each opening and shall comply with all the general provisions of this chapter.

268. Fire Escapes, Balconies, Platforms.) All buildings of Class IIc shall be equipped with stairway fire escapes not less than three feet in width which shall, in number, location and structural features, comply with the general provisions of this chapter relating to fire escapes. The balconies and platforms of such fire escapes shall be not less than three feet in width and may be made with a smooth surface of incombustible material laid flush with the floor and with a pitch of one-third inch to the foot.

269. Standpipes and Portable Hand Pumps.) (a) On each floor of every building used for the purposes of Class IIc there shall be provided, for each two thousand square feet of floor area or fractional part thereof, at least one portable hand pump of three gallon capacity or one chemical extinguisher of equal capacity, which shall be located and maintained subject to the approval of the Fire Marshal.

(b) In every building more than three stories in height hereafter erected for or converted to the purposes of Class IIc there shall be constructed one or more four-inch stand pipes which shall extend from the basement to the roof and which shall be connected with the house pump and house tank and which shall have a Siamese connection located on the street or alley side of such building for the use of the first department. Each stand pipe shall be provided with one hose connection with fire department thread on the roof of said building, and one connection on each floor and in the basement thereof, with sufficient hose attached on each floor and in the basement reach any point thereof. The pattern, quality, installation and maintenance of such subject to the approval of the Fire Marshal.

## ARTICLE VI. Class III.

270. Class III Defined.) (a) In Class III shall be included every building used as a family residence, and also every building used for garage or stabling purposes and having a ground area of less than 500 square feet

27014. Must Comply With General and Special Provisions.) Every building of Class III shall comply with the provisions of this chapter, and, in addition to the general provisions, shall comply with the following special provisions:

\*271. Buildings—Construction of—Height of—Space Occupied on Lot.) (a) Every building of Class III which is ninety feet or more in height shall be built entirely of fire-proof construction.

(b) Every building of Class III less than ninety feet and more than fifty feet in height shall be built entirely of slow-burning, mill or fireproof construction.

(c) Every building of Class III less than fifty feet in height may be built of ordinary construction.

(d) The amount of space occupied on any lot by Class III buildings shall comply with the requirements of Section 440 of this chapter.

(e) Buildings used for garage furfoses only, having a graind area of four hundred (400) square feet or less, may be built with enclosing walls and roof of corrugated iron or galvanized sheet steel supported on a frame of steel construction.

\*Amended December 18, 1911, by adding

• (e). 272. Skylights — Construction of — Glass in.) (a) The skylight on the roof of every building of Class III creeted within the fire limits shall have its sides, sashes and frames constructed of metal or of metalclad wood on all exterior surfaces.

(b) Such skylights shall be covered by a strong wire netting with mesh not more than one and one-half inches square placed not less than six inches above the glass, supported on uprights of incombustible material, unless wired glass is used.

273. Allowance of Live Loads in Construction of Floors.) In every building of class III, the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of the floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of 40 pounds for every square foot of surface.

\*174. Habitable Rooms—Definition of— Requirements as to Size and Ventilation.) (a) For the purposes of this chapter the term "habitable room" shall be held to include every room in every building of Classes III and VI, and every room in buildings of other classes if such rooms are used for the purposes of Classes III and VI, in which a family or the individual members thereof regularly sleep or eat or carry on their usual domestic or social vocations or avocations. Laundries, bath rooms, water closet compartments, serving and storage pantries, storage rooms and closets, boiler and machinery rooms, cellars, corridors, and similar spaces used neither frequently nor during extended periods, shall not be deemed as coming within the scope of this term.

as coming within the scope of this term.

(b) In every building hereafter erected for or converted to the purposes of Class III, every habitable room shall have a window or windows with a total glass area equal to at least one-tenth of its floor area, opening onto a street, alley, or yard, as defined in Section 422 of this chapter; provided, that there shall be a space of at least three feet between the building and the lot line on one side, and a space of at least one foot between the building and the lot line an the other side. None of such required windows shall have a glass area of less than ten square feet; and each such window shall have its top not less than seven feet above the floor and shall be so constructed that at least its upper half may be opened its full width. No such habitable room shall have a floor area of less than eighty square feet, nor a clear height from floor to ceiling of less than eight feet and six inches; provided that atter rooms need not be eight feet six inches high for more than one-half of their area, and that such after rooms shall have total cubic contents of net less than seven hundred and fifty cubic feet each.

\*Amended February 20, 1911.

(c) No living room shall be partitioned off or constructed in any existing building or portion thereof, until plans of such building and room have been filed with, and a permit for such partitioning or constructing obtained from the Commissioner of Buildings and the Commissioner of Health; and every room so partitioned off or constructed shall comply with all the requirements for habitable rooms as contained in this section.

275. Alcoves.) Every alcove and alcove room shall comply with the requirements of Section 446 of this chapter.

276. Pantries, Bath Rooms, Water Closet and Urinal Compartments—Require ments in Relation Thereto.) In every building hereafter erected for or converted to the purposes of Class III, every pantry, bath room, water closet or urinal compartment shall have at least one window with a glass area of at least six square feet and a minimum width of at least one foot opening upon a street, alley, or yard as defined in Section 422 of this chapter, or upon a vent shaft not less in area than said window; and no habitable room shall open into or connect with a vent shaft thus used.

277. Bay Windows and Light Shafts—Materials For.) Bay or oriel windows may be built of combustible material on front or rear elevations of buildings of Class III of two stories or less in height, within the fine limits, provided such bay and oriel windows shall not have a greater width than twelve feet at the wall line of the building, and, provided, that the outside walls, roofs and softits of such bay or oriel windows, when so constructed, shall be covered with sheet metal or other incombustible material. Light shafts wholly within the walls of a two-story building of Class III may be built of combustible material covered with sheet metal or other incombustible material. In all other cases, bay and oriel windows and light shafts and their supports shall be constructed entirely of incombustible material.

278. Walls—Brick Walls Upon Wooden Sills—Level of Sills Allowed.) Every building of Class III not exceeding one story or twenty feet in height from top of sills to

the highest point of the roof, and with the side walls not exceeding fourteen feet in neight, and with floor area not exceeding twelve hundred square feet, may have brick walls not less than eight inches in thickness erected upon wooden sills, the sills supported on iron, masonry, or concrete sup-ports extending four feet below the surface of the ground, provided that the portion of the supports above the ground may con-sist of cypress or cedar posts. The foundations under such supports shall be of concrete, stone or brick, each covering not less than five square feet area and not more than than hive square feet area and not then eight feet apart, to support with safety the weight that may rest upon them; sills shall be placed not higher than four feet above the established grade of the street upon which the lot fronts and upon which lot the building is erected, where grades are established, and not exceeding seven feet above the ground where grades are not established. Every building more than one story and less than two stories high, having a gable or hip roof with a rise of not more than thirty degrees, may have eight-inch walls of solid brick or stone masonry, provided the walls do not exceed fourteen feet abia height measured from the first floor joist, and provided such building has a floor area not exceeding 1,200 feet and is not over 22 feet in width.

279. Stairways in Buildings of Class III Hereafter Erected Three Stories or More in Height.) In every building of Class III hereafter erected, and three stories or more in height, there shall be either two stairways from the first to the top story or one such stairway and a fire escape.

#### ARTICLE VII.

## Class IV.

(Note: See end of ordinance, page 153, for special ordinance on regulations for operating places of amusement.)

- 280. Class IV Defined.) (a) In Class IV shall be included every building referred to in subdivisions Class IVa. Class IVb, Class IVc and Class IVd, as follows:
- (b) In Class IVa shall be included every building used as a church or place of worship.
- (c) In Class IVb shall be included every building having a parish hall, lodge hall, dance hall, ball ball skating rink, assembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction, other than schools included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVc, IVd, and V.
- (d) Class IVc shall include every building hereafter erected used for moving picture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, and where the seating capacity does not exceed three hundred; provided, that every building of Class IVc existing at the time of the passage of this ordinance shall comply with the provisions of Class IVb.
- (e) In Class IVd shall be included every grandstand and every baseball, athletic and amusement park.
- 281. Must Comply with General and Special Provisions.) Every building or structure of Class IV shall comply with the general provisions of this chapter and shall, in addition, comply with the following special provisions:
- 282. Must Comply With All Ordinances.) It shall be unlawful for any person, firm or corporation, to construct or alter any theatre,

- except in conformity with the ordinances of the City of Chicago relative thereto, or to operate any theatre that does not conform thereto.
- 283. City Officials Empowered to Enter.) The Commissioner of Buildings. Commissioner of Health. City Electrician, Fire Marshal, Superintendent of Police, and their respective assistants, shall have the right to enter any building used in whole or in part for the purposes of Class IV at any reasonable time, and at any time when occupied by the public, in order to examine such building, and it shall be unlawful for any person to interfere with them in the performance of their duties.
- 284. City Officials Empowered to Close.) The Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician, or Superintendent of Police, or any one of them, shall have the power, and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class IV, to be closed, where it is discovered that there is any violation of any of the provisions of this chapter, and kept closed until the same are complied with.
- 285. Theaters in Frame Buildings Prohibited.) On and after June 1, 1911, no frame building or part thereof shall be used as a moving picture, vaudeville or other theatre.
- 286. Buildings—Height—Construction—When Used in Part as Class IV.) Every building higher than sixty feet, used in whole or in part for the purposes of Class IV or connected with or made part of any building so used, shall be entirely of fireproof construction. Every such building less than sixty feet in height shall be made of fireproof, slow-burning or mill construction, except as provided in this chapter.
- 287. Class IVa Defined.) In Class IVa shall be included every building used as a church or place of worship.
- 288. Frontage—Seating Less than Eight Hundred.) Every building of Class IVa hereafter erected containing an aggregate capacity of 800 persons or less shall have for the auditorium a frontage upon two open spaces, of which at least one shall be a street, and the other, if not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street or alley.
- 289. Frontage—Seating Over Eight Hundred.) Every building of Class IVa hereafter erected containing an aggregate seating capacity greater than eight hundred persons, shall have for the auditorium a frontage upon three open spaces of which at least one shall be a public street and the others, if not streets, shall be public or private alleys of a width of not less than ten feet each, opening directly on a public street or alley.
- 290. Construction of.) (a) Every building of Class IVa, which has a seating capacity of less than 600 may be built of ordinary construction. Every building Class IVa having a seating capacity of more than 600 and less than 1.800 shall be built of slow-burning, mill or fireproof construction.
- (b) Every building of Class IVa having an aggregate seating capacity greater than 1.800 persons shall be built of fireproof construction.
- 291. Limitations of Floor Level in Class IVa—Height Above Sidewalk.) (a) The limitations of floor levels in buildings hereafter erected, occupied either wholly or in part for the purposes of Class IVa, shall be as follows:

- (b) No auditorium of a greater seating pacity than 1,000, shall have the highest capacity than 1,000, shall have the highest part of its main floor at a greater distance than 10 feet above the adjacent sidewalk grade. No room or rooms having a greater seating capacity than five hundred shall be at a greater distance above the sidewalk grade than twenty feet. No room or rooms used for the purposes of Class IVa having a greater seating capacity than two hundred shall be at a higher level above the sidewalk grade than thirty feet; provided, how-ever, that in the case of a building used building used either wholly or in part for the purposes of Class IVa, and built of fireproof construction, a room or rooms to be used for the purposes of Class IVa and of an aggregate seating capacity of less than five hundred may be located in any story thereof, but in such case, there shall be at least two separ-ate and distinct flights of stairs from the ate and distinct flights of stairs from the floor or floors in which such room or rooms are located, to the ground, each of which stairs shall be not less than 4 feet wide in the clear and shall be equipped with emergency exits and not less than one stairway fire escape.
- 292. Allowance for Live Loads in Construction of Floors of Buildings of Class IVa—Stairways—Entrances and Exits, IVa—Stairways—Entrances and Exits, Width of.) Every floor in buildings of Class IVa shall be designed and constructed in such a manner as to be capable of bearing in all its parts, in addition to the weight of floor construction, partitions, and permanor construction, partitions, and perma-ment fixtures that may be set upon same, a live load of 100 pounds for every square foot of surface on such floor. The width of stairways in buildings of this class shall be twenty inches for every one hundred of the aggregate seating capacity, and for fractional parts of one hundred seating capacity, a proportionate part of twenty inches shall be added to the width of such stairway, but no stairway in such building shall be less than four feet wide in the clear, except as hereinafter provided, and provided further, that in any such building having a gallery, the seating capacity of which does not exceed two hundred and fifty persons, two separate and distinct stairways, each not less than three feet wide, shall be permitted.
- Galleries-Exit and Entrance.) Distinct and separate exits shall be provided for each gallery. A common place of exit and entrance may serve for the main floor of the auditorium and the gallery or gau-leries, provided its capacity be equal to the aggregate capacity of all aisles or corridors leading from the main floor and such gallery or galleries to such place of exit or entrance. Not more than two galleries, placed one above the other, shall be permitted in any building of (Class IVa).
- Stairways-Aisles-Steps in Aisles -Passageways, Kept Unobstructed.) (a) Aisles in buildings of Class IVa shall, in the aggregate, be eighteen inches in wiath for each 100 of the seating capacity of the auditorium, and for fractional parts of 100, a proportionate part of 18 inches shall be added, but no aisle shall be less than two feet six inches in width in its narrowest part. Steps shall be permitted in aisles only as extended from bank to bank, of seats, and wherever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made on an inclined plane; and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and there shall be a light so placed as to illuminate such steps in such outside aisles or corridors. All aisles and passageways shall corridors. be kept free from all portable furniture and other obstructions, and no person shall be

allowed to stand in or occupy any of such aisles or passageways during the services.

(b) \*Amended February 20, 1911, by strik-

ing out said paragraph.

- 295. Corridors, Passageways, Hallways and Doors—Width of.) The width of corridors, passageways, hallways and doors, adjacent to, connected with, or a part of the auditorium, shall be computed in the same manner as is herein provided for stairways and aisles, excepting, however, that no such corridor, passageway or hallway shall be less than four feet in width, and no such doorway shall be less than three feet in width
- 296. Seats, Number of, in Rows.) There shall not be more than fourteen seats in any one row between aisles. Rows of seats shall not be less than two feet eight inches from back to back, and no bank of seats shall be of greater rise than twenty inches.
- 297. Emergency Exits—All Doors to Open Outward.) (a) Emergency exits and outside stairways shall be provided for every building of Class IVa, which has a larger seating capacity than 800. Such emergency exits shall be one-half the aggregate width of the main exits, but no such emergency exits shall be less than three feet in width. Provided, that such stairways may be built inside the walls of the building in a corridor or passageway not less than seven feet wide and enclosed by a fire-proof partition not less than four inches thick. Such stairway shall be of fireproof construction. All emergency exits and stairways therefrom shall be kept free from obstructions of any kind including snow and

(b) All doors affording egress, directly or indirectly from the auditorium to a street or alley, shall open outward. Exit doors shall not be obscured by draperies and shall not be locked or fastened in any manner during the time that the building is oc-cupied, and shall be so constructed and maintained that they may be easily opened from within.

- Buildings in Which Seats are Not Fixed—Seating Capacity.) In computing the seating capacity of any room or building used for the purposes of this class in which the seats are not fixed, an allowance of six square feet of floor area shall be made for each person, and all space between the walls er partitions of such room or building shall be measured in this computation. Provided, that in buildings of Class IVa standing at least seven feet from any other building and not having more than two stories and each its own separate having seating capacity of such floor shall be estialone as determining the kind of construction under this article,
- 299. Every Portion to Be Lighted When Occupied at Night—Flues.) Every portion of a building of Class IVa and all outlets therefrom leading to streets or spaces con-nected therewith, including the vestibules, halls, corridors, passageways, and stairway exits, shall be properly lighted whenever ocexits, shall be properly lighted whenever oc-cupied between sunset and sunrise, and the same shall be kept so lighted until the en-tire audience have left the premises; and every passageway, corridor, stairway and exit shall be provided with a sign indicating the way out of the building, the letters of which shall not be less than six inches in height. All lights indicating exits in ves-tibules, halls, passageways, corridors or other means of egress from the building shall be controlled by a separate shut-off, located pear the main entrance, and conlocated near the main entrance, an trolled only in that particular place. the main entrance, and conlight furnished by gas or sperm oil shall be kept burning, in connection with the word "Exit" over every such opening, during the

entire time such building is occupied between sunset and sunrise. Flues used to carry off heat from open lights shall be of incombustible material, and shall have at least twelve inches clearance from any combustible material.

## Class IVb.

300. Class IVb Defined.) In Class IVb shall be included every building having a parish hall, lodge hall, dance hall, banquet hall, skating rink, assembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction, other than schools, included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVc, IVd, and V.

menuded in Classes Iva, Ivc, Ivd, and v. 301. Frontage—Seating Less Than Eight Hundred—Seating More Than Eight Hundred.) (a) Every building of Class IVb, containing a hall or halls of an aggregate seating capacity of 800 persons or less, shall have a frontage upon two public spaces, of which at least one shall be a street, and the other, if not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street or alley.

(b) Buildings of Class IVb, containing halls or rooms, used for the purpose of class IVb, of greater aggregate seating capacity than 800, shall have a frontage upon three open spaces, of which at least one shall be a public street, while the other two, if not streets, shall be public or private alleys, of a width of not less than ten feet, each opening directly on a public street or alley; provided that a fireproof passageway at grade level, and not less than seven feet in width may be used in place of one such apublic thoroughfare.

202. Auxiliary Buildings—Height and Construction of—Communicating Doors.)
(a) Every building hereafter erected and connected with or made part of any building used in whole or in part for the purposes of Class IVb. shall, if sixty or less feet in height, be of fireproof, mill or slow-burning construction, except as otherwise provided in this chapter, and, if more than sixty feet in height, of fireproof construction.

tion.
(b) No existing building, other than of fireproof construction, shall be connected to any building of Class IVb now existing or hereafter constructed, unless there is, between such buildings, a fire wall constructed as required by Section 519 of this chapter and extending from the ground to and through the roof.

(c) In all such cases where both buildings are not of fireproof construction, each opening in the intervening walls shall be equipped with automatic double fire-doors as required by Section 573 of this chapter.

303. Existing Buildings—Used for Class IVb and for Other Purposes.) No part of an existing building, other than of fireproof construction shall be used for the purposes of Class IVb unless such part is separated from all portions of the same building used for other purposes by a fire wall constructed as required by Section 519 of this chapter and extending from the ground to the roof and unless all openings in such fire wall are equipped with automatic double fire doors as required by Section 573 of this chapter; in which case such other portions may be constructed in the manner permitted for separate buildings of such class.

304. Construction—Depending on Capacity.) Every building used for the purposes of Class IVb, hereafter erected. con-

taining a hall or room of an aggregate seating capacity of not more than 1,500 persons, shall be built of mill. slow-burning or fireproof construction. Every building hereafter erected used for theatrical purposes, with a seating capacity greater than three hundred shall be built to conform to the requirements of buildings of Class V hereafter erected. If a hall or room or halls or rooms have a total seating capacity of more than 1,500 persons, such building shall be built of fireproof construction; provided, that buildings mainly used for exposition or exhibition purposes, and not used for theatrical purposes, and not exceeding two stories in height which have for public use only a main floor and one gallery and which have their walls and structural members of incombustible material and which comply with the provisions of this ordinance as to stairways, exits and fire escapes, may have their temporary seats, boxes, show cases, platforms, or booths, constructed of combustible material; provided, however, that any and all draperies, buntings, or other inflammable decorations shall be treated with a fire-retarding solution, subject to the approval of the Fire Marsbal.

305. Buildings in Which Seats Are Not Fixed—Scating Capacity.) In computing the seating capacity of any room or building used for the purposes of this Class, in which the seats are not fixed, an allowance of six square feet of floor area shall be made for each person, and all space between the walls or partitions of such room or building shall be measured in this computation. Provided, that in buildings of Class IVb standing at least seven feet from any other building and not having more than two stories and each floor having its own separate exits, the seating capacity of each floor shall be estimated alone as determining the kind of construction under this article.

\*306. Limitations of Floor Levels—Height Above Sidewalks.) (a) The following limitations of floor levels in buildings hereafter erected, occupied either wholly or in part for the purposes of Class IVb, other thousand shall heas follows: No auditorium of a greater scating capacity than one thousand shall have the highest part of its main floor at a greater distance than ten feet above the adjacent sidewalk grade. No room or rooms having a greater scating capacity than five hundred shall be at a greater distance above the sidewalk grade than twenty feet. No room or rooms used for the purposes of Class IVb having a greater scating capacity than two hundred shall be at a higher level above the sidewalk grade than thirty feet; provided, however, that in the case of a building used either wholly or in part for the purposes of Class IVb, and built of fireproof construction, a room or rooms to be used for the purposes of Class IVb and of an aggregate scating capacity of less than five hundred may be lecated in any story thereof, but in such case, there shall be at least two separate and distinct flights of stairs from the floor or floors in which such room or rooms are located, to the ground, each of which stairs shall be not less than four feet wide in the clear and such floor or floors shall be equipped with emergency exits and have not less than one stairway fire escape.

(b) In buildings of fireproof construction recatter erected, banquet hal's or ball rooms having a seating capacity of not more than 900 may be located on any floor. Such banquet halls or ball rooms shall have access to at least two interior stairways and not less than one stairway fire escape, the combined width of which shall be equal to at least 18 inches for each one hundred persons for whom accommodations are provided in said banquet hall or ball room.

(c) No room or hall used for the purpose of a skating rink shall be constructed, operated or maintained with its main floor level more than two feet above the inside sidewalk grade of the street upon which the building containing same fronts or more than one fool above the ground or sidewalk level in front of such building when it does not face on a street.

\*Amended July 22, 1912.

307. Allowance for Loads in Construction of Floors.) All floors of all buildings of class IVb shall be designed and constructed in such a manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floor, in accordance with the general provisions of this chapter.

Stairways-Entrances and Exits-\*308. Width of.) The width of stairways in buildings used wholly or in part for the purposes of Class IVb, shall be 18 inches for every 100 persons of the aggregate seatfor every 100 persons of the aggregate seating capacity of all rooms used for the purposes of Class IVb in such buildings; but no stairway in such building shall be less than four feet wide in the clear; provided, than four feet wide in the clear; provided, that in any such building having a room or rooms, balcony or gallery, used for the purposes of Class IVb, the aggregate seating capacity of which does not exceed 250 persons, two separate and distinct stairways, each three feet wide, shall be permitted, but no such building hereafter erected shall have less than two interior stairways of the width required by this ordinance, and located as far apart as practicable. Every hall or required by this ordinance, and located as far apart as practicable. Every hall or room used for the purposes of Class IVb in a building hereafter erected, shall have access to not less than two stairways. Every stairway shall have bandrails on each side thereof; stairways which are over seven feet wide shall have decrease. over seven feet wide shall have double intermediate handrails with end newel posts at least five and a half feet high; no stairway shall ascend a greater height than 13 feet 6 inches without a level landing, which lead a menes without a revel fanding, which landing shall be not less than four feet wide measured in the direction of the run of the stairs. Every stairway leading to a box or boxes shall be independent of all others retains a content of all others. a box or poxes shall be independent of all other stairs or seats; and such stairway shall not be less than 2 feet 6 inches wide in the clear when such box or boxes seat not to exceed thirty people, and an additional width of one inch shall be added to such stairway for each additional five persons for whom seating capacity is provided. \*Amended July 22, 1912.

309. Balconies and Galleries—Designation of.) Where there are balconies or galleries, the first balcony or gallery shall be designated "balcony" and the second and third balconies or galleries shall be designated respectively "gallery" and "second gallery."

silo. Balconies and Galleries—Exit and Entrance.) Distinct and separate places of exit and entrance shall be provided for each gallery. A common place of exit and entrance may serve for the main floor of the auditorium and the balcony, provided its capacity be caual to the aggregate required capacity of all aisles or corridors leading from the main floor and such balcony to such place of exit and entrance.

311. Aisles—Steps in Aisles—Passageways—Kept Unobstructed—Width of Corriders, Passageways, Hallways and Doors.)
(a) Aisles in rooms used for the purposes of Class IVb shall have in the aggregate a width of 18 inches for each 100 of the seating capacity of such room, and for fractional parts of 100 a proportionate part of 18 inches shall be added; but no aisle shall be less than two feet six inches in width.

- (b) Steps shall be permitted in aisles only as extending from bank to bank of seats, and whenever the rise from bank to bank of seats is less than five inches the floor of the aisles shall be made as an inclined plane, and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and there shall be a light so placed as to illuminate such steps in such outside aisles or corridors. All aisles and passageways in such rooms shall be kept free from campstools, sofas, chairs and other obstructions, and no persons shall be allowed to stand in or occupy any of such aisles or passageways during any performance, service, exhibition, lecture, concert, ball, or any public assembly.
- (c) Where there are emergency exits located at the sides of such rooms, there shall be a cross aisle giving access to such exits. The location of emergency exits and cross aisles shall be subject to the approval of the Commissioner of Buildings.
- 312. Corridors, Passageways, Hallways and Doors—Width of.) The width of corridors, passageways, hallways and doors adjacent to, connected with or a part of such rooms, shall be computed in the same manner as is herein provided for stairways and aisles, excepting, however, that no such corridor, passageway or hallway shall be less than four feet in width, and no such door shall be less than three feet in width.
- shall be not more than fourteen seats in any one row between aisles, and in a room or rooms used for the purposes of Class IVb, of a seating capacity greater than 400 persons, there shall be an aisle on each side of any bank of seats, where there are over seven seats in a row. Rows of seats shall not be less than thirty-two inches from back to back and no bank of seats shall be of a greater rise than twenty inches.
- sits and stairways shall be provided outside of any and all rooms used for the purposes of Class IVb which have a seating capacity larger than eight hundred, and such emergency exits shall have a width equal to one-half of the width provided for the main exits and such emergency exits shall have a width equal to one-half of the width provided for shall lead directly to a public thoroughfare. Provided, however, that any room or rooms used for the purposes of Class IVb in any building hereafter creeted, having a seating capacity of more than 400, shall have emergency exits outside of the walls of such building equal in width to one-half of the exits required for the main exits, and such emergency exits shall lead directly to a public thoroughfare. Doors leading to emergency exits shall not be less than three feet wide. Stairs shall be not less than four feet wide. Such emergency exits and stairways may be built inside the walls of such building of a width not less than four feet, provided that they are enclosed by a fireproof partition not less than 4 inches thick; and further provided, that the stairs themselves are constructed of incombustible material. Emergency stairways may descend into open spaces or passageways, provided they do not obstruct more than one-half of the width of such open spaces or passageways.
- (b) Every stairway fire escape shall be located and constructed in accordance with the requirements of Sections 669, 670 and 673, but in no case shall any room used for the purposes of Class IVb located above the third story of any building have less than one stairway fire escape.
- 315. Doors to Open Outward—Draperies.)
  (a) All doors affording access directly or indirectly to the street, alley or corridor

from any room used for the purposes of Class IVb shall open outward.

- (b) It shall be unlawful for any person, nrm or corporation to obscure the exit doors of any room of a building of Class IVb as defined in this chapter, by draperies, and during the time any such room or rooms are open to the public, said doors shall not be locked or fastened in any manner so as to prevent them from being easily opened outwardly: and such doors shall be constructed and maintained so as to require no special knowledge or effort to open them from the interior.
- 316. Walls Between Auditorium and Stage.) There shall be a solid brick wall of the same thickness as required for outside walls between the auditorium and stage in buildings hereafter erected for or converted to the use of Class IVb and used either wholly or in part for that purpose; and in existing non-fireproof buildings such wall must extend to a height of three (3) feet above the roof. Provided, however, that in existing buildings any room used for the purposes of Class IVb at the date of the passage of this ordinance having a greater seating capacity than four hundred (400) shall have a proscenium wall built of masonry or incombustible material.
- 317. Curtain Shall Be of Iron, Steel or Asbestos—Inspection of—Fee.) The main curtain opening in any such room shall have a wrought iron or steel or three-ply asbestos curtain with a wire mesh imbedded therein, which shall be inspected by the Building Department semi-annually, for which inspection a charge of five dollars shall be made, and all other openings in the proscenium wall shall have self-closing iron doors.
- 318. Structures Over Ceiling—Construction.) If any structure intended to be occupied by people is built over the ceiling of any room, used wholly or in part for the purposes of Class IVb, the girders or trusses supporting the same shall be of steel protected with fireproofing as required for interior columns in Section 625.
- 319. Standpipe and Hose on Stage.) In every room used for the purpose of Class IVh and having a seating capacity of 250 or more, and where scenery is used a standpipe not less than one and one-half inches in diameter, with a hose connection and hose valve thereon, shall be installed on each side of the stage, and shall at all times have connected thereto and ready for use, a hose of sufficient length to reach any part of the stage. Such standpipes shall be connected with pump or frostproof gravity tank so that a pressure of water of ten pounds per square inch shall be furnished through such standpipe at the highest
- 320. Vents or Flue Pipes.) (a) One or more vents of flue pipes of metal construction or other incombustible material approved by the Commissioner of Buildings shall be built over the stage, and shall extend not less than ten feet above the highest point of the roof, and shall be equivalent in area to one-twentieth of the area of the stage.
- (b) In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls, and shall be continued and run up on the exterior of the building to a point five feet above the highest point of the additional stories.
- (c) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof,

- and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches, or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.
- 321. Fuse Boxes.) Every fuse box shall be surrounded by two thicknesses of fire-proof material with an air space between, and no fuse shall be exposed to the air between the switchboards; all electrical equipment in such rooms shall be installed and maintained to the satisfaction and approval of the City Electrician.
- 322. Capacity—Certification for License.)
  (a) The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class IVb may accommodate, according to the provisions of this Chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.
- (b) No amusement license shall be issued for any room used for the purposes of Class IVb, unless the Commissioner of buildings, the Fire Marshal and the City Electrician shall first have certified, in writing, that such room complies with the provisions of this Chapter in every respect.
- 323. Exits—Signs at—Lighting Of.) (a) The word "Exit" shall appear in letters at least six inches high over the openings to every means of egress from every room used for the purposes of Class IVb, and in every such room having a greater seating capacity than 400, a red light furnished by gas or sperm oil shall be provided over such sign.
- (b) Every room used for the purposes of Class IVb and all outlets therefrom leading to the streets, including passageways. courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such rooms and spaces, and every pressageway, court, corridor, stairway, exit, and emergency stairway, shall be provided with signs indicating the way out of the building, the letters of which shall not be less than six inches in height.
- 324. Lights in Halls, Corridors and Lobbies—Control Of—Separate Shutoff—Connection with Gas Mains—Protection of Suspended and Bracket Lights—Protection of Lights Insorted in Walls—Protection of Lights Insorted in Walls—Protection of Lights—Construction of Border Lights—Ducts and Shafts Conducting Heated Air From Lights—Protection of Stage Lights.) Gas and electric lights in the halls, passageways, corridors, lobbies and other means of ingress to or express from any such room shall be controlled by a separate shutoff, located in an accessible place, subject to the approval of the Commissioner of Buildings, and controlled only by that particular place. No gas or electric light fixture shall be inserted in the walls, woodwork, ceilings or in any part of any such room, unless protected by fireproof materials. The footlights, if gas light, shall be protected by wire network, and also by a strong wire guard, not less than two feet distant from such footlights and a trough containing such footlights and a trough containing such footlights shall be formed of and be surrounded by fireproof materials. Border lights shall be constructed according to the best known methods, subject to the approval of the City Electrician, and shall be suspended by wire rope. Ducts and shafts used

for collecting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double with an intervening air space. Stage lights, if gas, shall have strong wire guards or metal screens, not less than ten inches diameter, so constructed that any material coming in contact therewith shall be out of reach of flame, and such guards or screens shall be firmly soldered to the fixtures in all cases.

325. Scenery—Definition—Movable Scen-cy.) (a) "Scenery" as used in this chap-er shall include all scenery, drop curtains erv.) and wings which are constructed or made of cloth, canvas or combustible material,

whether stationary or movable.

"Movable scenery" shall include all scenery, drop curtains, borders and wings which are made movable for the purpose of changing scenery and substituting another set during or between the various stage acts.

326. Scenery to Be Non-Inflammable.) No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class IVb. unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

\*327. Amount of Scenery Allowed— Sprinkler System.) Two sets of house scenery and three drops, exclusive of asbestos ery and three drops, exclusive of aspessions fire curtain and picture screen shall be allowed in existing rooms used for theatrical purpses in buildings of Class II'b where the same are on the first floor level, or in a building of fire-froof construction or which conformed with the requirements of fire-froof buildings at the time same requirements of firefroof buildings at the time same was erected, and the same shall also be allowed in such existing rooms used for theatrical purposes above the first floor level when the scating capacity of such room does not exceed soo. Such scenery shall be known and designated upon the licenses issued by the city as "Permanent House Scenery," and the use and moving of such scenery shall not be construed as placing said building, hall, room or theatre within the processions of the ordinance relating to Class I' buildings.

A set of house se-nery as contemplated by this section is hereby defined to mean sufficient scenery being in continuous use in such house; provided, however, that the lowering of a drop shall not constitute a new stage setting.

stage setting.

No other scenery except as above enumerated shall be permitted on, above or under-

the stage,

Every existing Class II'b theatre affected by this section shall be equipped with an approved sprinkler system and also with standfipe and hose subject to the approval of the Free

No existing Class IVb theatre affected by No existing class for treater and teaching this section shall increase its seating capacity after the passage of this ordinance.

No scenery or stage paraphernalia of combustible materials shall be used on the stage

of any room or theatre used for the pur-posts of Class IIIb, unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall a paint or enemical solution which shall make it non-inflammable, and which treated scenery or stage parapher ralia, or both, shall be tested and approved by the Fire Marshal. \*Amended July 22, 1912.

325. Dressing Room Partitions.) tions forming dressing rooms, except where already built, shall be constructed of in-

airready built, shall be constructed of in-combinstible material, and such dressing rooms shall be properly ventilated. 229 Apparatus Under Control of Fire Marshal) The standpipes, hose, vent flues and all apparatus for the extinguishing of fire or guarding against the same, required the provisions of this ordinance to be

provided shall be at all times so provided and kept in a manner satisfactory to the Fire Marshal.

CLASS IVc.

\*330. Class IVc Defined—Moving Picture and Vaudeville Shows—Seating Capacity.) Class IVc shall include every building hereafter erected used for moving picture or vaudeville shows and similar entertainments, where an admission fee is charged and reguwhere an admission fee is charged and regular performances are given, and where the seating capacity does not exceed three hundred, provided that every building of Class IVc existing at the time the passage of the ordinance known as The Chicago Code of 1911 shall comply with the provisions of Class IVb. All buildings hereafter erected for moving ficture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, with a seating capacity of over three hundred, and for the exhibition of moving pictures only, where the seating capacity is more than one thousand, shall be built to conform with the requirements for buildings of Class V hereafter rected as contained in this chapter, Buildings for the exhibition of moving pictures only and with a seating capacity of over three hundred, but not to exceed one thousand, shall also be built to conform with the requirements for built-ings of Class V hereafter erected, in all their structural requirements and equipment except in so far as such requirements and equipment are modified in Sections 331 and 332 hereof.

\*Amended June 21, 1912.

\*331. Frontage of Class IVc-Frontage, Open Spaces and Fireproof Passageways of Moving Ficture Theatres Containing a Seating Capacity of more Than Three Hundred.) Every room used for the purposes of Class IVc shall have a frontage upon at least two public thoroughfares, of which at least one be a street, and the other a street or shall a public or private alley not less than ten feet wide and opening directly on a public

street or alley.

Buildings for the exhibition of moving pictures only, with a scatting capacity of over three hundred only, with a seating capacity of over three hundred but not to exceed one thousand, shall be located so that they adjoin at least two public thorough-fares, one of which shall be a public street and the other may be a public alley not less than ten feet in width. Except as hereinafter otherwise pro-vided, the audience room of such building shall have either a public thoroughfare or an open space anobstructed from the ground to the sky on each thate either a public thoroughfare or an open space unobstructed from the ground to the sky on each side thereof. Such open space, when the audience room has a capacity not to exceed six hundred seats, shall be five feet wide, and six inches shall be added to the width of same for every additional one hundred seats in said audience room up to the maximum of one thousand seats. In all cases where there is a public alley in the rear of such building, said open space must connect directly with the alley. In case the entire audience is seated on the ground level said open spaces shall extend alongside of the audience room so as to connect with exit doors placed approximately in the middle of the audience room between the opposite ends of same. Where there is a baleony or gallery installed, such open spaces must extend along the entire length of the audience room so os to connect with exit for the staff of the audience room so so to connect with exit staff of the audience room so os to connect with exit for the staff of the field of the audience room so os to connect with exit for the staff of the audience room so os to connect with exits from the baleony or gallery at their highest and lovest levels. Where such a entire length of the audience room so os to con-nect with exits from the baleony or gallery at their highest and lowest levels. Where such a building is located on a corner lot and adjoins a public street on one side and a public street or an alley not less than ten feet wide on two of the remaining sides and the building is so located that it adjoins such public thoroughfares on three sides for its entire extent it shall not be necessary sides for its entire extent, it shall not be necessary to construct an open space on the remaining side thereof, but in all such cases there shall be either an open space unobstructed from the ground to an open space unobstracted from the ground to the sky or a freproof passagecay at least five feet wide leading from the side of the audience room not bordering on a street or other public space to the street in front of the theatre and another lead-ing to the alley or other public space in the rear of the theatre. If the seating capacity of such theatre is over six hundred, six inches shall be added to the width of such open space or passage-way for every one hundred seats or fraction thereof in excess of six hundred and up to the maximum of one thousand. If access to the street and alley or other public space as herein provided is by means of a firefroof passageway, such firefroof passageway must be constructed in all respects according to the provisions of Section 402 of The Chicago Code of 1911, except as herein otherwise provided. provided.

\*Amended June 21, 1912.

\*332. Construction.) Buildings of Class IVe hereafter erected, of a seating capacity not to exceed three hundred shall not be built more than thry feet in height and may be built of ordinary construction, but the enclising walls shall be constructed of mesons. We were shall be constructed of masonry. No ing picture, vaudeville or theatrical shall hereafter be installed in a frame building. No room or hall used for the pur-poses of Class IVe shall hereafter be instailed underneath any living or sleeping room

Buildings for the exhibition of moving pictures only with a seating capacity of more than three hundred but not to exceed one thousand, when the same shall be located as provided for in Section 331 same statt be lective as frowned for in Section 3, hereof, may be built as herein provided. Said buildings shall contain no stage, proseenium wall nor scenery of any description. The screen for the display of the pictures must be attached to the rear wall of the building, not to exceed six inches away from same. No decorative walls or pantings or other effects shall be constructed inside the audience room in such a manner as to allow any rooms or spaces between same and the enclosing walls of building. An open platform not to exceed the building. An open platform not to exceed seventy-two square feet in area may be built before the picture screen. On the main floor of such building there shall be at least two main aisles with direct exits at front and rear and two cross aisles with direct exits from the sele. When such building contains a bulcony or gallery there shall be emergency exits from the highest and lowest levels of same on one sele and on the other side there shall be either engaged. there shall be either emergency exits or enclosed interior stairs from the highest level of the balcony, and the lowest level of the balcony shall be cony, and the lowest level of the baleony shall be connected with such side stars by means of a tunnel. All seats in the audience room shall be at least twenty inches wide and spaced thirty-four inches from back to back. The booth for the moving picture machine runst be of construction in conformity with the requirements for such machine booths in buildings of Class IVe; in all other respects such buildings shall comply both in structural requirements and equipment with the provisions of the ordinances relating to theatres of Class IV hereafter exceed. hereafter erected.
\*Amended June 21, 1912,

333. Floor Levels-Limitations.) The following limitations of floor levels shall apply lowing limitations of floor levels shall apply to every building used for the purposes of Class IVc; the highest part of the auditorium floor shall not exceed four feet above the sidewalk level. The floor level at the entrance shall not be at a greater height than eight inches above the sidewalk. The aisles shall not have a greater incline than 1½ inches to the foot.

334. Stairways.) Where external stairways are required, such stairways shall be at least six inches wider than the exits, and shall have treads not less than ten inches wide and risers not more than 8 inches high, and shall be provided with suitable headening and the able handrails on each side thereof, and the width of such stairs shall comply with the requirements of Class IVb.

335. Balconies and Galleries.) In nonfreproof buildings hereafter erected for, or converted to the purposes of Class IVc, not more than one balcony and no galleries shall be constructed.

336. Aisles—Steps and Aisles—Passages to be Kept Unobstructed.) Aisles and rooms used for the purposes of Class IVc shall have in the aggregate, a width of not shall have in the aggregate, a which of how less than 20 inches for each 100 of seating capacity of such room and for fractional parts of 100, a proportionate part of 20 inches shall be added, and no aisle shall have a width of less than two feet six inches. When side emergency exits are permitted, there shall be a cross aisle not less than three feet wide, leading directly to said exit. Steps shall not be permitted in any aisle or in any portion of the auditorium floor. Every aisle, passageway, entrance and exit shall be free from turnstiles, railings or other obstructions.

337. Corridors - Fassageways - Doors -Width Of.) The width of corridors, passageways and doors shall be computed in the same manner as provided in Sections 311 and 312.

338. Seats—Size—Location.) There shall not be more than ten seats in any one row between aisles, nor more than six seats be-tween an aisle and side wall. Seats shall not be less than thirty-two inches from back to back and shall not be less than twenty inches in width measured at the top of the seat back, and shall be secured firmly to the floor.

339. **Exits.)** In every building of Class IVc, there shall be provided at least two entrance doors. No entrance doors shall be 339. Exits.) entrance doors. No entrance doors shall be less than four feet in width. If the rear of the building abuts upon an alley, there shall be provided not less than two emergency exits leading directly to the said alley. Wherever emergency exits pass over or under the stage floor level, they shall be enclosed with walls of masonry nine inches in thickness, or four-inch hollow tile, or of two-inch solid plaster, composed of iron studs and metal lath and plaster, and shall study and metal fath and praster, and shall have floors and ceilings of slow-burning, mill, or fireproof construction. If the side of the auditorium abuts upon a street or alley, such emergency exits shall be located as follows: one exit shall be located at a distance not greater than five feet from the proscenium wall or stage, and the other exit shall be located at a distance half way between the foyer and the stage wall. Exits by means of stairways or stairway fire escapes, equal in width to eighteen inches for each one hundred persons, shall be provided, and for fractions, parts of one hundred, proportionate part of eighteen inches shall be added. No such exit shall be less than two feet six inches in width.

Doors to Open Outward.) affording ingress or egress in buildings of Class IVc shall open outward, and no door Class IVc shall open outward, and no door shall be less than three feet wide. Such doors, as well as any entrance or exits or opening, shall not be obscured by curtains or draperies, and no door shall be locked or fastened at any time during the time such building is open to the public, and no door opening shall be less than three feet wide. Such doors shall be so constructed wide. Such doors shall be so constructed and maintained that they may easily be opened from within.

341. Walls Between Auditorium and Stage.) Where the area of the stage exceeds 72 square feet, there shall be provided ceeds 72 square feet, there shall be provided a proscenium wall of solid masonry of not less than nine Inches in thickness, extending from ground to the roof. Where the stage area is less than 72 square feet its prosenium wall may be constructed of two-inch solid plaster walls, composed of metal studs and metal lath and plaster or three-inch hollow tile. In no case shall the underside of ceiling or roof over stage house behind proscenium wall he at a higher level than or ceiling or root over stage house behind proscenium wall be at a higher level than three feet over the highest point of main proscenium opening. And there shall be no trap doors or other openings in the stage floor floor.

342. Curtain.) (a) The main curtain in the opening of the proscenium wall shall be composed of long libre asbestos twisted on brass wire and woven into a close cloth. The laps shall be sewed with two lines of brass and asbestos stitching, which laps shall not be less than one-inch wide. Said cloth shall be lapped at least four times around the top and around the bottom bars with at least three lines of the stitching above specified.

- (b) The edge of the curtain shall be continuously reinforced by lapping and stitching and also with pieces of sheet metal for clips. The curtain shall be at least thirty inches wider and higher than the masonry opening, and shall have steel top and bottom bars of not less than two square inches in cross section which bars shall be connected by four three-sixteenthinch steel cables.
- (c) There shall be three-eighth-inch spanning cables with upper ends secured to steel brackets fastened to the wall and the lower ends sufficiently counter-weighted to keep the cables taut and where cables pass through the stage floor, the holes shall be metal bushed.
- (d) The curtain shall have hard wood eyelets not over eighteen inches center to center, around the standing cables on both vertical edges, which eyelets shall be secured to the curtain by bent brass clips riveted to the curtain with double sheet metal reinforcing.
- (e) There shall be steel lifting cables, one-half inch in diameter, at each end of the curtain and at intermediate points not over ten feet apart attached to drums on shafts located above the curtain.
- (f) The operating machinery shall be built according to good mechanical engineering practice.
- (g) There shall be emergency chains midway between the lifting cables, to hold the curtain which shall be equal in strength and efficiency to the lifting cables.
- (h) There shall be steel guides of not less than three-eighth-inch metal on each side of the curtain from the stage floor to the level of the overhead sheaves. The metal guides shall lap the edges of the curtain not less than four inches. The curtain shall be incombustible in all its parts and its operating devices.
- (i) The painting and the manner of tripping the curtain and the number of and the location of places for tripping shall be subject to the approval of the Fire Marshat.
- (j) A permit shall be obtained from the Department of Buildings for the erection of each such curtain. The Commissioner of Buildings shall inspect each such curtain semi-annually for which semi-annual inspection, a fee of \$5.00 shall be charged.
- 343. Other Openings in Stage Walls.) Every other opening in the proscenium wall or in the other walls of the stage shall have self-closing incombustible doors.
- 344. Structure Over Ceiling—Construction.) A structure may be built over the ceiling or roof of any building used wholly or in part for the purposes of Class IVc, provided such space is not used for sleeping or living purposes. Girders or trusses supporting same shall be of steel protected by interpooling as required in Section 625 and the entire ceiling shall be covered with incombustible material subject to the approval of the Commissioner of Buildings.
- 345. Ricture Machine Booth.) The walls, floor and ceiling of every moving picture booth or machine house shall be built of four-inch hollow tile or four-inch solid concrete, supported on iron beams or columns, the door of operating room to be metal clad and swing outwards. There shall be a metal smoke or flue pipe eighteen inches in diam-ter extending from ceiling to three feet above roof of machine house and terminating in the open air.

- 346. Standpipes and Hose on Stage.) When the stage area exceeds seventy-two square feet and combustible scenery is used on stage, there shall be a water stand-pipe not less than 1½ inches in diameter with hose connections and hose of sufficient length to reach any and all portions of stage. Said stand-pipe shall be connected to either a fifteen-hundred-gallon frost-proof gravity tank located twenty-five feet above stage level, or to a two-inch city pipe connection, satisfactory to the Fire Marshal.
- 347. Vent or Flue Pipe Over Stage.) (a) When the stage exceeds seventy-two square feet in area and combustible scenery is used, one or more flue pipes of incombustible material and equivalent to one-twentieth of the area of the stage shall be built over the stage and shall extend eight feet above the highest point of roof.
- (b) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.
- 248. Fuse Boxes.) Every fuse box shall be surrounded by two thicknesses of fire-proof material with an air space between, and no fuse shall be exposed to the air between the switch boards; all electrical equipment in such rooms shall be installed and maintained to the satisfaction and approval of the City Electrician.
- 349. Capacity—Certification for License.) The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class IVc may accommodate according to the provisions of this chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.
- 350. Exits, Signs and Lights.) (a) The word "Exit" shall appear in letters six inches high over the openings to every means of egress from such room, and a gas or sperm oil light with red globe shall be provided at or over such exit sign.
- (b) Every room used for the purposes of Class IVc and all outlets therefrom leading to the streets, including passageways, courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such room and spaces, and every passageway, court, corridor, stairway, exit and emergency stairway, shall be provided with signs indicating the way out of the building, the letters of which, shall not be less than six inches in height.
- 351. Lights in Halls, Corridors and Lobbies—Control of—Separate Shutoff—Connection with Gas Mains—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights, Ducts and Shafts Conducting Heated Air From Lights—Protection of Stage Lights.) Gas and electric lights in the halls, passageways, corridors, lobbies, and other means of ingress to or egress from any such room shall be controlled by a separate shutoff,

located in an accessible place, subject to the approval of the Commissioner of Buildings and controlled only in that particular place. No gas or electric light fixtures shall be inserted in the walls, woodwork, ceilings or in any part of any such room, unless protected by fireproof materials. The footprotected by fireproof materials. The foot-lights, if gas lights, shall be protected by wire net work, and also by a strong wire guard, not less than two feet distant from such footlights, and a trough containing such footlights, shall be formed and be surrounded by fireproof materials. Border lights shall be constructed according to the best known methods subject to the approval of the City Electrician and shall be suspended by a wire rope. Ducts and shafts used for collecting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double with an intervening air space. Stage lights, if gas, shall have strong wire guards or metal screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of flame, and such guards or screens shall be firmly soldered to the fixtures in all cases.

352. Apparatus Under Control of Fire Marshal.) The standpipe, hose, vent flues, and all apparatus for the extinguishing of fire or guarding against same, required by the provisions of this chapter to be provided, shall be at all times so provided and kept in a manner satisfactory to the Fire Marshal.

353. Scenery Requirements—Fire Proof Solution.) (a) All scenery on the stage shall be made stationary, and shall consist of not over two asbestos curtains, three stationary wings on each side and four stationary border drops. All scenery and stage paraphernalia shall be treated with a paint or chemical solution every six months, which shall make it non-inflammable, and which treated scenery or stage paraphernalia shall be tested and approved by the Fire Mar-shal. Where no combustible scenery is used or where all scenery is made of metal, the smoke flue over the stage and the standpipes may be dispensed with at the discretion of the Commissioner of Buildings and the Fire Marshal.

(b) Scenery supported by and constructed entirely of incombustible material, shall not be considered as sets of scenery provided

for in this section.

254. **Dressing Room Partitions.)** Partitions forming dressing rooms, except where already built, shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.

355. Frontage Consents Required.) No building of this class shall hereafter be constructed for, or converted to the use of said class, unless frontage consents are secured as required by the ordinances of the City of Chicago and filed with the Commissioner of Publings. missioner of Buildings.

356. Class IVd Defined.) In Class IVd shall be included every grand stand and every baseball, athletic and amusement park.

357. Loads—Allowance for Live Loads.) The floors and stairs of grand stands and bleacher stands, existing or hereafter built, shall be designed and constructed in such manner as to be capable of bearing in all their parts and supports, in addition to the weight of the floor construction, partitions and permanent fixtures, that may be set upon the same. a live load of not less than one hundred pounds for every square foot of surface of said floors, and a live load of not less than one hundred and fifty pounds for every square foot of the bearing surface of the stairs. \*358. Grandstands—Frame within Fire Limits—Grandstands Hereafter Constructed

Limits—Grandstands Hereafter Constructed
— Fireproof — Frontage Consents.) (a)
Wooden grandstands or tiers of seats commonly
known and described as grandstands now constructed or in the process of construction may be
erected, repaired or enlarged within the fire limits
where no part of any such structure shall be
worthin sixty feet of any other building or structure. All grandstands hereafter erected within the
fire limits, except as hereinafter provided, shall
be made of firetrand or unwatered. ture. All grandstands hereafter erected within the fire limits, except as hereinafter provided, shall be made of fireproof or unprotected steel construction. The enclosing walls, if enclosed, shall be made of fireproof or incombustible materials, but the seets may be made of wood. Grandstands outside the fire limits, or inside the fire limits rehere the seating capacity does not exceed five thousand persons, may be constructed of wood, but no part of any such structure shall be within less than sixty feet of any other building or structure. The braces, supports and the underside of all seats, including bleacher seats, shall be treated with a fire-retarding solution once a year before opening up the premises containing such stand to the public. opening up

the public.

(b) Every person, firm or corporation desiring a permit for the construction of a grandstand, except in connection with such as are now in existence, shall first obtain the consent in writing of the owners of a majority of the frontage on both sides of the street or streets on each side of the block or square in which it is desired to creet with event conditions.

such grandstand.

\*Amended, Dec. 19, 1910. 359. Width of Aisles and Exits—Number of Seats Between Aisles.) (a) The width of aisles and exits in all grandstands conof aistes and exits in all grandstands con-templated in Section 356, hereafter con-structed, shall be in no case less than 36 inches and such width shall be increased toward the exits which serve as regular entrances, such width being computed at the rate of eighteen inches per 100 seats or fractional part thereof in non-fireproof grandstands, and at the rate of twelve grandstands, and at the rate of twelve inches for each 100 seats or fractional part thereof in fireproof grandstands.

(b) The number of scats between aisles in any row shall not exceed twenty in non-fireproof grandstands, nor thirty in fire-

proof grandstands.

No exit, gate or door, shall be locked or bolted during the occupancy of such stands by the public. All aisles, passageways, corridors and exits shall be kept free

obstructions of any kind.

Temporary Seating

360. Temporary Seating Structures.)
Temporary seating structures for shows and outdoor exhibitions and the observation of holidays and special occasions may be built of combustile material, providing they are built structurally strong enough to support a live load of one hundred pounds per square foot, and comply with the provisions of Class IVb in regard to means of exit, aisles and rows of seats; and provided, further, that a permit be secured from the Commissioner of Buildings, which shall in no case be issued by him until the party desiring to erect said temporary seating strucshall secure the written consent of a majority of the property owners or their duly authorized agents, on both sides of the street between the two nearest intersecting streets on which said temporary seating street between the two nearest intersecting streets on which said temporary seating struction is to be located. And further provided that any permit issued for any such temporary seating structure as herein-above provided for in this section shall not entitle the person so receiving said permit to use said temporary seating structure for more than ten consecutive days from the first day on which it is so used; and further first day on which it is so used; and further provided that any temporary scating struc-ture provided for in this section shall be removed within ten days after the use of the same as provided for in this section, and if not so removed it shall be the duty of the Commissioner of Buildings to order the same to be removed or torn down by the Fire Marshal.

361. Use of Roofs Used for Spectatorial Purposes—Prohibited.) It shall be unlawful for any person, firm or corporation whether owner, lessee, manager or in possession and control or having charge of any building within the city to permit the use of the roof of any such building, whether free of charge, or through admission fee, to any person or persons as a place of observation or for spectatorial purposes

#### Amusement Parks.

- 362. Roller Coaster Devices.) No roller coaster, scenic railway, or other riding, silding, or rolling device, shall be hereafter erected of a greater height from the ground than 55 feet. All such coasters, railways, riding or other devices shall be equipped with safety clutches. The cars, or any receptacles, which persons are permitted to occupy, or in which they are permitted to travel, ascend or descend, shall have hand rails of sufficient number and height to prevent people from being thrown therefrom, and of such character as shall be approved by the Commissioner of Buildings.
- shall hereatter be unlawful for any person, nrm or corporation, to build, construct, establish, produce or carry on, any amusement within any ground, garden or enclosure of the kind commonly known and described as amusement parks, wherein shows of different classes are offered or presented by one or more concessionaries, without first securing written frontage consents as required by the ordinances of the City of Chicago. Such frontage consents shall be filed with the Commissioner of Buildings before a permit shall be issued for the construction of any building or structure connected in any way with such amusement park.
- \*364. Requirements.) (a) Buildings hereafter erected within an amusement park, located outside the fire limits, shall comply, except as herein otherwise specified, with the provisions of Class IVb.
- (b) Buildings hereafter erected within amusement parks located outside of the fire limits and not exceeding one story in height and which do not contain more than one balcony may be built with a self-supporting steel frame designed as required by this chapter. Such structures may be enclosed with metal lath covered with cement plaster, which plaster shall be not less than one and one-third inches thick, or such structures may be enclosed with galvanized iron. The roots of such structures may be of ordinary construction supported on steel trusses and covered with a gravel or composition roof, approved by the Commissioner of Buildings.
- (c) Every moving picture theatre kercafter built within an amusement park shall comply with the provisions of Class IVc. \*Amended June 26, 1911.
- 365. Open Space Between Buildings.) There shall be an open and unobstructed space of not less than four feet between each and every frame building hereafter erected in an amusement park, where the buildings do not exceed twenty feet in height, and of not less than six feet where the buildings are over twenty feet and less than thirty feet in height, and of not less than thirty feet in height, and of not less than ten feet where the buildings are over thirty feet in height. Where brick or concrete or other fireproof walls of full seventeen inches in thickness are used between such buildings and where such buildings are built of slow-burning construction, these spaces shall not be required, but, in such cases, there shall be a space of ten feet in width at intervals of every two hundred feet

- 366. Standpipes—Fire Plugs—Hose.) There shall be installed within the grounds of every amusement park, an adequate system of water pipes with branch connection to fire plug, with sufficient hose connected to city pressure, so as to furnish at all times a good and efficient force of water, which will enable the extinguishing of fire at or within each and every building. The size of water mains, standpipes, fire plugs, hose, as well as the location, number, and quantity of same, shall be subject to the approval of the Fire Marshal. All hose connection shall be the standard size used by the Fire Department of Chicago and shall be approved by the Fire Marshal.
- 367. Roller Coasters—Scenic Railways, Rtc.—Permit Fee—Certificate of Test and Safety.) Before any roller coaster, scenic railway, water chute, or other mechanical, riding, sailing, sliding or swinging device is erected, either in existing or new amusement parks, a detailed plan shall be submitted to the Commissioner of Buildings, for his approval or rejection, and, if approved, a permit shall be procured by the person, firm or corporation desiring to erect such device. The permit fee shall be fifty dollars for each such device. Before such device is opened to the public each season, a certificate of inspection, signed by a competent engineer, approved by the Commissioner of Buildings, must be furnished, certifying to the practicability, strength and safety of such devices, and all such device or devices shall be examined by the Commissioner of Buildings or his employees upon completion and each year before opening up to the public.
- 368. Must Comply With All Ordinances.) It shall be unlawful for any person, firm or corporation to construct, alter or operate any amusement park or any building or structure therein unless they comply with the ordinances of the city relative thereunto.

## ARTICLE VIII.

(Note: See end of ordinance, page 153 for special ordinance on regulations for operating places of amusement.)

#### Class V.

- 369. Class V Defined.) In Class V shall be included every building which is used as a public theater where an admission fee is charged and in which movable scenery is used, and every assembly hall hereafter erected having a seating capacity of over 300 and containing a permanent stage on which scenery and theatrical apparatus are used and regular theatrical vaudeville performances are given; provided, however, that public halls and club halls with a seating capacity of less than six hundred, although occasionally used for theatrical presentation, shall not be considered as public theatres within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stages thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V as herein defined. Such public halls and club halls shall be included in Class IV as defined in this section.
- 369½ Must Comply With General and Special Provisions.) Every building of Ciass V shall comply with the general provisions of this chapter and shall also comply with the following special provisions:
- 370. City Officers Empowered to Enter Buildings.) The Commissioner of Buildings, Commissioner of Health. Fire Marshal, City Electrician, Superintendent of Police, or any of them, and their respective assistants, shall have the right to enter any building used wholly or in part for the pur-

poses of Class V, and any and all parts thereof, at any reasonable time, and at any time when occupied by the public, in order to examine such buildings, to judge of the condition of the same and to discharge their respective duties, and it shall be unlawful for any person to interfere with them, or any of them, in the performance of their duties.

The Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician and the Superintendent of Police, or any one of them, shall have the power, and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class V, closed, where it is discovered that there is any violation of any of the provisions of the chapter, and keep same closed until such provisions are complied with.

complied with.

372. License — Mayor Shall Revoke.)
Upon a report to the Mayor by the Commissioner of Buildings, Commissioner of Health,
Fire Marshal, City Electrician or the Superintendent of Police that any requirement of
this chapter or that any order given by
them or any of them in regard thereto has
been violated, or not complied with, the
Mayor shall revoke the license of any such
theatre or place of amusement so reported
and cause the same to be closed.

Buildings of Class V Now in Existence.

373. Buildings of Class V Now in Existence.) The following provisions shall apply to Class V buildings in existence at the time of the passage of this ordinance:

374. Walls—Outside—Must Comply with Requirements of Section 519.) The outside walls of all such buildings in existence at the time of the passage of this ordinance, the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more shall comply with the requirements of Section 519.

375. Columns in Walls—Alterations.) If iron or steel columns are introduced in the walls referred to in Section 374, the brick work around the same shall be bonded into that of the connecting walls, and each of such columns shall be fireproofed as provided in Sections 624 and 625 of this chapter. All alterations in such existing buildings, to make them comply with the requirements of this chapter may be executed with the same kind of materials as those originally used in the construction of such buildings; provided, that after the said building is brought into compliance with the provisions of this chapter, then all subsequent alterations, enlargements, repairs, replaced or strengthened structural parts damaged by fire, wear and tear, or otherwise, shall be made of fireproof construction or iron or steel construction covered with fireproof materials, as provided by this chapter.

376. Other Classes Built in Conjunction with Class V—Doors for Openings Between Connecting Buildings.) In all cases where existing buildings used wholly or in part for the purposes of Class V are built in conjunction with or as part of buildings devoted to the uses of other classes and where such buildings of the other classes, as specified in this ordinance, are not built entirely of fireproof construction, double iron doors shall be placed at each connecting opening between such buildings of Class V and the building connected therewith.

\*377. Floor Levels—Limitations of.) (a) Any audience room used for the purposes of Class V now in existence containing in the aggregate not more than five hundred seats, if in a fireproof building, may be maintained in any story thereof, but in such case there

shall be at least two stairways to the ground, from the floor or floors on which each such room is located, each of which stairways shall be not less than four feet in width in the clear.

(b) In existing buildings of fireproof construction, having an audience room with a seating capacity of more than five hundred and less than fifteen hundred, the lowest bank of seats of the main floor thereof shall be not more than twelve feet above the street level, and every such building shall in all other respects conform to the requirements of this ordinance. The main floor of any existing theatre of any kind of construction shall not be raised above its fresent elevation.

\*Amended July 22, 1912.

378. Loads—Allowance for Live Loads in Construction of Floors of Class V.) For all buildings of Class V all floors shall be designed and constructed in such manner as to be capable of supporting in all their parts, in addition to the weight of floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors.

379. Stairways—Entrances and Exits.)
(a) Stairways, affording egress from any room or rooms used for the purposes of Class V shall be equivalent in width to twenty inches for every one hundred or seating capacity of such room, and for fractional parts of one hundred a proportionate part of twenty inches shall be added, but no such stairway shall be less than four feet wide in the clear, except as hereinafter provided in this section.

(b) All such stairways shall have hand railings on each side thereof and shall not ascend to a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall not be less than the width of the stairs. No run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over 7 feet wide shall have double intermediate handrails with end newel posts at least 5½ feet high.

(c) Steps shall not have a greater rise than 8 inches, treads shall not be narrower than 10 inches, and winders shall not be used on any staircase, except where circular staircases are expressly permitted.

(d) In existing theatres every balcony and gallery shall have separate and distinct entrance stairways from the sidewalk level, except that in cases where the vestibule or entrance to any such theatre is not more than fifteen inches, or two steps, above the sidewalk level and such steps are at or near the building line, the stairways to such balcony and gallery may ascend from the floor of such vestibule or entrance, but if the run of the stairs at the bottom is not toward the street, there shall be a hand rail or rails, three feet above the floor constructed from the foot of such stairways for a distance of not less than five feet leading toward the street. All doors intervening between such stairways and the street shall, during each and every performance, be kept unfastened.

(e) There shall be an iron stairway or stairways from the stage to the fly galleries and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairways may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.

(f) Every stairway leading to a box or boxes shall be independent of all other stairs or seats; and such stairway shall

not be less than two feet eight inches wide in the clear, when such box or boxes seat not to exceed thirty people, and an addi-tional width of one inch shall be added to such stairway for each additional five per-

sons for whom seating capacity is provided.

(g) Every stairway on the stage side of the proscenium wall shall be not less than

two feet six inches wide.

- Instead of increasing the width re-(h) quired for entrances, aisles, exits and stairways to that required by this chapter, the owner, lessee or manager of any such theatre shall have the privilege of reducing the number of permanent seats therein until the same ratio between such width and number of the s ber of seats as hereinbefore provided for shall be established, and if such privile be taken advantage of, it shall be the duty of the Commissioner of Buildings to make inspection and certify that such ratio actu-ally exists before a license for the operation of any such theatre shall be issued.
- Floors and Exits.) Floors at all exits shall be level and flush with adjacent inside floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.
- 381. Seats in Rows Between Aisles.)
  (a) Not more than ten seats in any row shall be permitted between aisles in any gallery. On the main floor and balcony more than eleven seats shall be permitted between aisles; except in rows of scats which are within twenty feet from the exits, in which case thirteen seats shall be permitted between aisles.
- (b) Seats shall be not less than twenty inches in width measured at the top of the seat backs. Rows of seats shall be not less than two feet eight inches from back to back.

No bank of seats shall be of greater rise

than twenty-two inches.

(c) All groups of seats shall be so arranged that there shall be an aisle at each side of each group, except that groups of five seats or less may abut upon a tunnel at one side and an aisle at the other. And except that a bank of seats abutting boxes or walls on main floor, balcony, and gallery, of not over five seats in a row, shall be required to abut upon one aisle only.

(d) The number of banks of seats on the main floor shall not exceed fifteen unless an intervening or cross aisle is provided between each fifteen banks of seats or unless a direct exit is provided for each aisle.

- (e) The number of banks of seats in the balcony shall not exceed nine unless an intervening or cross aisle is provided be-tween each nine banks of seats or unless a direct exit be provided for each aisle.
- 382. Tunnels—Cross Aisles—Vertical Rise
  —Foyer.) (a) There shall be no more
  than twelve-feet rise measured vertically than twelve-leet rise measured vertically in any aisle in any gallery without a direct exit by tunnel or otherwise to a corridor with free opening on to the gallery stairs or other direct discharge to the street, or at such elevation of twelve feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the elem feet wide in the clear.

  (b) No foyer shall be open to the theatre through the exits.

Main Floor—Balcony and Gallery-nation of.) (a) The lower floor **Designation of.)** (a) The lower floor of all theatres shall be designated the "Main Floor."

Where there are balconies or Icries, the first balcony or gallery shall be designated the "Balcony." and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery." 384. Aisles, Corridors and Passageways— Kept Unobstructed—Steps in Aisles.) (a) The minimum width of aisles with diverg-Aisles, Corridors and Passagewaysing sides in any room used for the purposes of Class V shall be two feet eight inches at the end near the stage and not less than three feet at the other end.

The minimum width of aisles with

parallel sides shall be three feet.
(c) Every aisle shall lead as nearly as possible directly to an exit, but in no case shall the center line of such exit be more than three feet from the center line of any such aisle leading thereto.

- (d) Steps shall not be permitted in aisles except as extending from bank to bank of seats, and no riser shall be greater than 8 inches, and no tread shall be less than 10 inches, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made as an inclined plane, and where steps are placed in outside aisles or corridors they shall not be isolated, but shall be grouped together and a light shall be maintained so that every place where there are steps in inclosing aisles or corridors shall be clearly lighted.
- (e) All aisles passageways, corridors and exits shall be kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles, passageways, corridors or exits during any performance, service, exhibition, lecture, concert or any public assemblage.
- 385. Corridors, Passageways, Hallways and Doors—Width of.) (a) The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, presenting below the same and the computer because of the construction of the constru excepting, however, that no corridor shall be anywhere less than four feet in width, and no door less than three feet wide, except as otherwise herein provided.
- (b) All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, check room or private office, shall lead directly to an outer exit of the building. Such corridors, passageways, building. Such corridors, passageways, hallways and stairways shall be at least three feet in width in every part, and shall be unobstructed in every part, and snall doors, not less than three feet in width in the clear, which shall swing outward and which shall not have locks or catches of any kind whatever.
- 386. Doors—Entrance.) (a) The width 386. **Doors—Entrance.**) (a) The winding of entrance doors to every theatre shall be computed on the basis of twenty inches in the clear to each one hundred permanent seats in the audience room and in addition the company of the state of twenty of the state of twenty of the state of twenty of twenty thereto a proportionate part of twenty inches for the fractional part of one hundred seats shall be added.

  (b) No mirror or architectural feature

shall be so arranged as to give the appearance of a doorway, exit, hallway or corridor

where none exists.

387. Dressing Room Partitions.) Partitions forming dressing rooms, except where already built, shall be constructed of inalready combustible material, and such dressing rooms shall be properly ventilated.

388. Emergency Exits—Width—Emergency Stairs—Width—Emergency Exits Inside Walls of Buildings—Fire Escapes, Escapes, Construction—Fire Escapes Leading or Alley-Doors Open Outward.) Street (a) Emergency exits and stairways shall be provided separately for each door, balcony and gallery and shall be of the same aggregate width as that provided for the main exits, and shall not be less than three feet in width. Such emergency exits shall feet in width. Such emergency exits shall be kept free of obstructions of every kind, including snow and ice.

(b) Such emergency exits and stairways may be built inside the walls of the building, provided they are enclosed by a fire-proof partition not less than four inches thick separating the exits and stair. thick separating the exits and stairways from the audience room or auditorium.

If said emergency exits lead outside (c) the building, the opening leading thereto shall have metal doors with wired glass panels. The doors shall open outward, and shall be nung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall. Outside shutters will not be permitted, except when they open automatically from the interior, without resistmatically from the interior, without resist-ance, and when used or open will automat-ically fasten, securely, flat against the wall, so as not to obstruct the passage on the outside; all such automatic devices or at-tachments to said doors or shutters shall be subject to the approval of the Commis-sioner of Buildings and the Fire Marshal of the City of Chicago.

(d) Whenever any such emergency stairway passes over an exit door, window or other opening, such stairway of the control of th other opening, such stairway shall be completely inclosed for a space of five feet greater in width than such opening, by iron, steel or other incombustible material,

(e) All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any doors. gates, bars or obstruction of any character.

(f) Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface or the ground to a street, alley or yard opening into an alley, or street, without entering into or passing through or over any building unless by a fireproof passage at least four feet wide and seven feet high on the court or ground level,

(g) All doors in openings from any and all exits and stairways shall be so con-structed that when opened they shall not obstruct any portion of any other doorway,

opening or passageway.

(h) All doors affording ingress to or egress from any theatre shall open outward and such doors shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

389. Wall-Brick Proscenium Wall Between Auditorium and Stage-Steel Curtain Fireproofed on Stage Side—No Combustible Material on Audience Side—Plans for Curtains-Permit from Building Department-Inspection Fee.) (a) There shall be in every theatre a solid brick wall of the same construction and thickness as is required in outside walls between the auditorium and the stage. The main proscenium opening shall have a substantial steel curtain vertically operated and fireproofed on the stage side, which shall be raised and lowered by mechanical power and shall be in constant use as the regular curtain and act drop. In vaudeville houses said curtain shall be lowered at least once during each performance.

(b) No combustible material other than painted decorations shall be applied to the

audience side of such curtains.

(e) Plans for such curtains shall be approved by the Commissioner of Buildings and a permit obtained previous to its erec-tion. The Commissioner of Buildings shall inspect such curtain semi-annually, for which inspection a fee of five dollars shall

(d) All other openings in such proscenium wall shall have iron doors, frames and

thresholds.

- 390. Stage—Construction of—Fireproof Paint—Scenery—How Treated.) (a) The training of the floor of every stage shall be of iron or steel. The stage floor may be be of from or steel. The stage floor may be of wood not less than one and three-tourths inches thick, and the under side of stage floor shall be saturated with a fireproof solution satisfactory to the Fire Marshal. The entire floor construction and floor of fly galleries, rigging lotts and paint gallery, all railings assignments. fly galleries, rigging lotts and paint gallery, all railings and supports and stanchions thereon, and all sheaves, pulleys and cables, and their supports, shall be of iron or steel. All woodwork and all framing for scenery used on or about the stage shall also be saturated with a fireproof solution, the same as prescribed for stage flooring.
- (b) Counter weighting of scenery must (b) Counter weighting of scenery mast be done with incombustible weights carried on steel cables and operated in grooves or on steel channels; except that small sand-bags, weighing not over eight pounds, may be used to bring down scenery ropes to stage level
- (c) No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for theatrical purposes, unless such scenery and paraphernalia shall have been treated with a fireproof or chem-ical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.
- 391. Vestibule for Stage Doors.) All doorways and openings in the rear or sides of the stage shall be vestibuled or arranged in a manner satisfactory to the Commissioner of Buildings so as to protect the cur-curtain, scenery and auditorium against curtain, scenery draughts of air.
- 392. Vents—Flue Fipes, Size of—Dampers—Switches for Dampers.) (a) One or more vents, or flue pipes, of metal construction or other incombustible material, suitable for carrying away smoke, approved by the Commissioner of Buildings, and extendone commissioner of bundings, and extending not less than fifteen teet above the highest point of the roof and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.
- In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of such additional stories.
- (c) All such flues or vents shall be pro-(c) All such fitted dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will electric control and the damper and will release said damper, should the switches or either of them, fail to operate. Such sta-tions shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the opera-tion of the same printed thereon tion of the same printed thereon.
- (d) All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuses shall be exposed to the air between the switch board.
- 393. Automatic Sprinklers-Location of-Tank—Connections.) (a) An approved system of automatic sprinklers shall be provided in every theatre of this class, with approved automatic closed circuit electric

devices, connecting the valves regulating the flow of water in the various sprinkler pipes, with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal shall direct, so arranged as to prevent any tampering with the system or the shutting off of the water trom the sprinkler pipes, without automatic notice to the Fire Department.

(b) Such system of automatic sprinklers shall be supplied with water from a tank located not less than twenty feet above the level of the highest sprinkler head in the system, and it shall be the duty of the fireman provided for in this ordinance to include in his daily report the result of an inspection to determine the sufficiency of water in this tank. Automatic sprinklers shall be placed in the paint room, store room, property room, scene-storage room, carpenter shop and dressing rooms. If such rooms are in or connected with a building used for the purposes of Class V, such tank shall not be connected with a standpipe and ladder system, but shall be filled through a separate pipe from a fire pump, and a three-inch iron pipe shall extend from such tank to the outside of such building, with Siamese connections, for fire department use. Such entire automatic sprinkler system and equipment and the location thereof shall be subject to the approval of the Fire Marshal.

\*391. Fire Apparatus on Stage—Hand Fire Pumps—Fire Apparatus.) (a) A standpipe not less than two and a half inches in diameter, having a hose valve or valves thereon, shall be installed on each side of the stage, with a hose connection at the stage and at each floor above and below the stage. Such standpipes shall be connected with a frost protected tank on the roof, containing not less than 3,000 gallons of water, and also with a power pump. A length of approved one and one-half inch unlined linen hose, with five-eighths inch smooth bore nozzle, shall be attached to each outlet. Hose, when not in use, shall be mounted on self-releasing racks of approved pattern. Approved portable fire extinguishers or hand fire pumps, shall always be kept ready for use on and under the stage, in fly galleries and in rigging lofts, and, in addition thereto, at least tour fire department axes and six pike poles shall be kept ready for use on each tier or floor of the stage.

(b)

\*Amended October 30, 1911, by striking out paragraph (b).

(c) All of the above mentioned equipment shall be installed and maintained under the direction of and subject to the approval of the Fire Marshal

(d) The use of ordinary hot-air furnaces or stoves is prohibited.

395. Lighting—Independent Lighting System for Exits—Red Lights Over Exits.)
(a) All stairways and corridors shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building and shall be in operation during the entire period such theatre is open to the public and until the audience has left the building. The word "EXIT" shall appear in letters at least six inches high over the opening to every means of egress from such theatre and a red light furnished by gas or sperm oil shall be provided over such sign.

(b) In every theatre every portion thereof devoted to the use or accommodation of the public, and all outlets therefrom leading to the streets, including open courts, corridors, stairways, exits and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such rooms and spaces, and every passageway, court, corridor, stairway, exit and emergency stairway shall be provided with signs indicating the way out of the building, the letters of which shall not be less than six inches in height.

396. Lights—Control of Lights in Halls, Corridors and Lobbies—Separate Shut-off—Connections with Gas Mains—Independent Connections—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights—Ducts and Shatts Conducting Heated Air from Lights—Gas and electric lights in the halls, corridors, lobbies or any other part of any theatre used by the audience, except the auditorium, shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying such theatre shall have independent connections for the auditorium and the stage, and provisions shall be made for shutting off the gas from the outside of the building. Suspended or bracket lights surrounded by glass in the auditorium, or in any other part of the theatre, shall be provided with proper wire netting underneath. No gas or electric lights shall be constructed according to the best known method and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire rope. Ducts and shafts used for conducting heated air from the main chandelier, or from any other lights, shall be constructed according to the best known method and satist used for conducting heated air from the main chandelier, or from any other lights, shall be constructed of metal and made double, with an air space between. Gas stage lights shall have strong metal wire guards or screens not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and shall be soldered to the fixtures in all cases.

397. Fire Apparatus—Under Control of Fire Department.) The standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtain, switch boxes, ventilators, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against the same, as provided for by this ordinance, shall be made and kept at all times in condition satisfactory to and under the control of the Fire Marshal.

398. Fire Alarm Apparatus.) Every theatre shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus connected by the necessary wires with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal may direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.

399. Capacity—Certification for License.) The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class V may accommodate according to the provisions of this chapter and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

\*400. Theatres in Frame Buildings Prohibited.) On and after July first, 1911, no frame building, or part thereof, within the city, shall be used as a moving picture, vaudeville or other theater; provided, that nothing herein contained shall be held to apply to any frame building existing at the time of the passage of this ordinance and in which a moving picture, vandeville or other theater is being maintained at the time of the passage of this ordinance, where all the scenery, if ony, used in connection with such meeting picture, vandeville or other theater, is constructed of either skeet-metal or asbestos, and where the omount of ext space for such theater is at least fifty (50) inches for each one hundred (100) seats therein contained, and where there is no living apartment of any kind used, maintained or occupied as such in any part of said building.

\*Amended June 26, 1911.

To Buildings of Class V Hereafter Erected.

The following provisions shall apply to buildings of Class V hereafter erected and used wholly or in part for such purposes:

- 401. Construction—Walls—Outside Walls—Structures.) All buildings of Class V hereafter erected shall be built of fireproof construction.
- 402. Frontage—Open Spaces—Fireproof Passageways.) (a) All buildings hereafter erected used wholly or in part for the purposes of Class V shall be located so that they adjoin at least two public thoroughfares, one of which shall be a public street and the other may be a public alley not less than ten (10) feet in width.
- (b) The audience room of every such building used for the purposes of Class V shall have either a public thoroughfare or an open space not less than ten feet wide extending from the lowest first floor level to the sky, on each of the two sides other than the proscenium and the foyer. Exit doors shall open onto such public thoroughfare or the bottom of such open space from the respective sides of the stage and of the main floor of the audience room, and onto balconies or platforms built in such public thoroughfare or open space at both the highest and the lowest floor levels of each and every balcony and gallery and the doors opening into such public thoroughfare or open space from any balcony or gallery or from the main floor shall comply with all the requirements prescribed in Section 410 of this chapter.
- (c) All such balconies or platforms shall be connected with stairway fire escapes leading to the street level or to the bottom of such open space and in the latter case they shall have their bottom run toward the public thoroughfare and such balconies or platforms and such fire escapes shall comply with all the requirements prescribed in Sections 669, 670 and 673 of this chapter. Every such open space, if it does not open into a public thoroughfare shall communicate with the public thoroughfare at the front side of the theatre by a fireproof passageway leading from the bottom level of such open space to the sidewalk level. Where there is a public thoroughfare behind the stage every such open space shall also communicate with such public thoroughfare by a fireproof passageway leading from the bottom level of such open space to the level of the public thoroughfare behind the stage, and passing under the stage.
- (d) The walls of a fireproof passageway shall be not less than four inches thick, and each and every part of such passageway, including each and all of its supports, shall be built of fireproof construction as required in the general provisions of this chapter relating thereto.
- (e) Radiators for warming passageways shall be in recesses sufficient in depth to prevent them from obstructing the passageway.
- (f) There shall be no steps or risers in fireproof passageways, but where necessary, inclined floors of the full width of the fire-of the floor shall not exceed two and one-

- half inches in height per foot measured horizontally, and no such incline shall be proof passageway may be built; the incline less than ten feet in length. No fireproof passageway shall be less than ten feet wide and eight feet high in any part thereof except at doors, and these door openings shall be not less than eight feet wide and seven feet high.
- (g) If the principal entrance corridor of a theatre is at one side and approximately at right angles to the central axis of the audience room, then the center line extended of such principal entrance shall intersect the center axis of the stage and the audience room between the back of the seat most remote from the stage, on said center axis of the stage and the audience room and at a point midway between such seat and the wall opposite the proscenium wall.
- 403. Buildings of Other Classes Built in Conjunction with Class V.) If buildings used wholly or in part for purposes of Class V, are built in conjunction with or as part of buildings devoted to the uses of other classes, then such buildings of other classes shall be built of fireproof construction.
- \*404. Floor Levels—Live Loads.) (a)
  The floor level of the highest bank of seats on the
  main floor shall not be more than three feet above
  the sidewalk level and the floor level of the lowest
  bank of seats shall not be more than eight feet
  belove the sidewalk level.
- (b) All floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, permanent fixtures and mechanisms that may set upon the same, a Free load of one hundred bounds for every square foot of surface in such floors.

\*Amended July 22, 1912.

- 405. Stairways—Entrances and Exits.)
  (a) Stairways affording ingress to or egress from any room used for the purposes of Class V shall be in width equivalent to twenty inches for each one hundred of seating capacity of such room, and for fractional parts of one hundred a proportionate part of twenty inches of width shall be added, but in no event shall any such stairways be less than four feet in the clear, except as hereinafter provided.
- (b) All such stairways shall have hand rails on each side thereof, and shall not ascend to a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall be not less than the width of the stairs; no run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over seven feet wide shall have double intermediate hand rails with end newel posts at least five and one-half feet high.
- (c) Steps shall not have a greater rise than eight inches, treads shall not be narrower than eleven inches, and winders shall rot be used on any staircase.
- (d) Every balcony and gallery shall have one or more separate and distinct exits and stairways to the sidewalk level. All gallery stairways shall lead to the top gallery and there shall be doors in same at each floor for exit purposes only. The bottom run of the stairs shall be directly toward the street. Such stairs may ascend from the vestibule or entrance inside of the buildings, but the bottom riser of such stairs shall be not more than sixty-five feet from the building line. All doors between such stairs and the street shall be kept unlocked and unfastened during each and every performance and until the audience has left the building.

- (e) There shall be an iron stairway or stairways from the stage to the fly gallery and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairway may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.
- (f) Stairs leading to a box or boxes seating not to exceed thirty people in the aggregate shall be independent of all other stairs and seats, and not less than two feet eight inches wide in the clear. For each additional twenty-five persons for whom seating capacity is provided, or major portion thereof, in such box or boxes there shall be an additional five inches in width of such stairway.
- (g) All stairways on the stage side of the proscenium wall shall be not less than two feet six inches wide.
- 406. Floors at Exits Seating.) (a) Floors at all exits shall be level and flush with adjacent inside floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.
- (b) There shall not be more than ten seats in any one row between aisles.
- (c) Seats shall not be less than twenty-two inches in width, measured at the top of the seat backs.
- (d) Rows of seats shall not be less than two feet ten inches from back to back.
- (e) No bank of seats shall have a greater rise than twenty inches. A bank of seats abutting boxes or wall on main floor, balcony or gallery of not over five seats in a row, shall be required to abut upon one aisle only.
- (f) Seats in loges and boxes shall be limited in the ratio of one seat for every six hundred and eighty square inches of floor area in such loge or box.
- (g) All groups of seats shall be so arranged that there shall be an aisle at each side of each group, provided groups of five seats or less may abut upon a tunnel at one side and an aisle on the other side.
- (h) The number of banks of seats on the main floor shall not exceed fifteen, unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle. The number of banks of seats in the "balcony" and "galleries" shall not exceed nine, unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.
- 407. Tunnels—Cross Aisles—Vertical Rise—Foyer.) (a) There shall be no more than eleven feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise, to a corridor with free opening onto the gallery stairs or other direct discharge to the street or at any such elevation of eleven feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than four feet wide in the clear.
- (b) No fover shall be open to the theater proper except through the exits.
- 408. Main Floor Balcony and Gallery— Designation of.) (a) The lower floor shall be designated the "Main Floor."
- (b) Where there are balconies or galleries, the first balcony or gallery shall be designated the "Balcony" and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery."
- 409. Aisles and Passageways—Steps in Aisles.) (a) The minimum width of aisles with divergent sides in any room used for the purpose of Class V shall be two feet eight inches at the end nearest the stage and not less than three feet at the other

- end. The minimum width of aisles with parallel sides shall be three feet.
- (b) Every aisle shall lead directly to an exit. Any exit located at the end of any aisle and at right angles thereto shall be considered a direct exit.
- (c) Steps shall not be permitted in aisles except as extending from bank to bank of seats, and no riser shall be more than eight inches in height, and no tread shall be less than ten inches in width, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisle shall be made as an inclined plane, and where steps are placed in outside aisles or corridors they shall not be inclosed but shall be grouped together, and a light shall be maintained so that every place where there are steps in inclosing aisles or corridors shall be clearly lighted.
- 410. Corridors—Passageways—Hallways and Doors—Width of. (a) The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting however, that no corridors shall be less than five feet in width and no doorway less than three feet wide, except as otherwise herein provided.
- (b) All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, cloak room, check room, or private office, shall permit of free passage, without returning, to an outer exit of the building. Such corridors, passageways, hallways and stairways shall be at least four feet in width in every part between such balcony or gallery and such outer exit, and shall be unobstructed in every part, excent by doors not less than three feet in width in the clear, which shall swing outward and which shall not be provided with locks or catches of any kind whatever.
- (c) The width of entrance doors to every theatre shall be computed on the basis of twenty inches in the clear to each 100 permanent seats in the audience room, and in addition thereto a proportionate part of twenty inches for the fractional part of 100 seats remaining shall be added.
- (d) No mirror or architectural feature shall be so arranged as to give the appearance of a doorway, window, exit, hallway or corridor where none exists.
- 411. Emergency Exits—Width—Emergency Stairs. Width—Emergency Exits Inside Walls of Buildings—Fire Escapes. Construction—Fire Escapes Leading to Street or Alley—Doors Open Outward.)

  (a) Emergency exits and stairways shall be provided separately for each floor, balcony or gallery and shall be of the same aggregate width as that provided for the main exits, and shall not be less than

the main exits, and shall not be less than three feet in width. Such emergency stairway shall be made of iron, steel or other incombustible material. Such emergency exit shall be kept free of obstructions of every kind, including snow and ice,

(b) Such emergency exits and stairways

(b) Such emergency exits and stairways may be built inside the walls of the building provided they are enclosed by a fireproof partition not less than four inches thick, separating the exits and stairways from the audionea, from an audiotectum.

audience room or auditorium.

(c) If such emergency exits lead outside the building, the onenings leading thereto shall have metal doors with wired glass parels. The doors shall onen outward, and shall be hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall, and outer shutters shall not be permitted.

(d) Whenever any such emergency stairway passes over an exit, door, window or other opening, such stairway shall be com-

pletely inclosed for a space of five feet greater in width than such opening, by iron, steel or other incombustible material.

(e) All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any door, gate, bars or obstruction of any character.

(f) Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

(g) All doors in openings from emergency exits and stairways shall be so constructed that when opened they will not obstruct any portion of any other doorway, opening or passageway.

(h) All doors affording ingress to or egress from any theatre shall open outward and shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

412. Wall-Brick Proscenium Between Auditorium and Stage—Steel Curtain Fire-proofed on Stage Side—No Combustible Ma-terial on Audience Side—Plans for Curtain —Permit from Building Department.) (a) There shall be a solid masonry wall of the same construction and thickness as is required in the outside walls of the building in which such theatre is located between the auditorium and the stage.

(b) The main proscenium opening shall ave a vertically operated steel curtain have a vertically operated steel curtain which shall, when it is lowered, completely close such proscenium opening. The curtain shall be raised and lowered by hydraulic power, and shall be in constant use as the regular curtain and act drop. In vaudeville houses said curtain shall be lowered at least once during the performances.

(c) The lowering of the curtain shall be controlled from not less than two points in the building, one of which shall be from the stage level and the other shall be desig-nated by the Commissioner of Buildings.

The curtain shall have a steel cov-(d) ering on the outer or auditorium side. The stage side covering shall be of a non-heat-conducting substance of such a thickness and such material as shall stand a test of two thousand degrees Fahrenheit on the stage side for fifteen minutes without heat-ing the opposite side to a higher tempera-ture than three hundred and fifty degrees Fahrenheit.

(e) All metal work with the exception of the frame shall be covered with such nonheat-conducting substances on the stage

(f) The curtain shall operate vertically in steel guides of such a cross section that the edges shall engage and secure the edges the edges shall engage and secure the edges of the curtain and prevent the curtain from leaving the guiding channel or channels if the curtain should tend to buckle or bag either inward or outward. No metal in the guide channel or in the engaging edge of the curtain shall be less than three-eighths an inch thick. The joints of the curtain  $\alpha f$ with the proscenium wall, with the stage floor and with the head of the opening shall be made gas tight as nearly as practicable.

(g) The calculations for the strength of the curtain, the curtain guides and the guide anchors, and the workmanship, shall be according to the best modern engineering practice. The stresses in the material and in the various sections of steel shall be within the safe limits of stress described in

this ordinance.

(h) No part of a curtain or of the cur-in guides shall be supported by or fasisin tened by any combustible material.

(i) The supports of the curtain and the curtain guides and edges and the curtain shall be of sufficient strength to safely resist either inward or outward a pressure of five pounds for each and every square foot of the curtain.

(i) No combustible material other than painted decorations shall be applied to the audience side of any such curtain.

(k) Plans for every such curtain shall be approved by the Commissioner of Buildings approved by the Commissioner of Buildings and a permit obtained therefor previous to its erection. The Commissioner of Build-ings shall inspect such curtain semi-annu-ally, and for each such inspection a fec of five dollars shall be charged.

(1) Every other opening in such pros-cenium wall shall have self-closing regulation standard iron fire doors and iron frames and thresholds; such doors and frames shall be built in such a manner as to resist warp-

ing.

413. Stage, Construction of—Fireproof Faint—Scenery—How Treated.) (a) The framing of the floor of every stage shall be of iron or steel or fireproof material. The stage floor may be of wood not less than two and three-fourths inches thick. The entire floor construction and fly galleries, rigging lofts and paint galleries, all stairways and supports and stanchions therein and all sheaves, pulleys, cables and other supports shall be of iron or steel. The woodwork of the stage floor shall be saturated with a fireproof solution satisfactory to the Fire Marshal. All other woodwork and all framing for scenery on or about the stage shall be coated with fireproof paint, which shall be submitted to and approved by the Fire Marshal. All wood used for the floor supports shall be saturated with a fireproof solution satisfactory to the Fire Marshal.

(b) Counter weighting of scenery must be done with incombustible weights carried on steel cables and operated in grooves or on steel cables and operated in stocked channels; except that small sand bags weighing not over eight pounds may be used to bring scenery ropes down to

stage level.

(c) No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class Y unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal. All draperies in the auditorium, including the drop curtains, must be fireproofed at least once a year, subject to the approval of the Fire Marshal.

414. Vestibules for Stage Doors.) All doorways and openings in the rear or sides of the stage shall be vestibuled or arranged satisfactory to the Commisin a manner sioner of Buildings, so as to protect eurtain. scenery and auditorium against draughts of air.

415. Structures Over Ceiling—Construction.) If any structure is built over the ceiling or roof of any theater, the different members of the girders or trusses supporting same shall be fireproofed in the manner prescribed for columns of fireproof buildings as specified in the General Pro-visions of this chapter.

416. Vents—Size of—Flue Pipes—Dampers—Switches for Dampers.) (a) One or more vents or flue pipes of metal construction, or other incombustible material, suitable for carrying away smoke, and approved by the Commissioner of Buildings, and extending not less than fifteen feet above the

highest point of the roof, and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

(b) In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point

of such additional story.

of such additional story.

(c) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches or lease said damper, should the switches or either of them, fall to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Nagshal subject to the practices of the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.

- (d) All fuse boxes shall be surrounded by two thicknesses of fireproof materials, with an air space between, and no fuses shall be exposed to the air between the switchboards.
- 417. Automatic Sprinkler Location Tank—Connections.) (a) An approved system of automatic sprinklers shall be provided in theatres of this class, which shall comply with the following requirements: Said sprinkler heads shall be placed in the paint room, store room, property room, scene storage room, carpenter shop, and dressing rooms and spaced according to the best fire protection practice: (2nd) Said system shall be supplied by a frostprotected gravity tank of not less than 5,000 gallons capacity located above stage roof tank shall be not less than and bottom of twenty-five feet above the highest sprinkler head, or by an automatic centrifugal pump of not less than 500 gallons capacity per minute against 100 pounds pressure at the pump; (3rd) Said gravity tank, if used, shall be entirely independent of any standpipe sys-tem, unless the tank is of sufficient capacity to supply both systems and unless the sup ply pipe to standpipe is so arranged that it can not reduce the sprinkler system sup-ply: (4th) Said gravity tank, if used, shall be filled through a supply pipe at least one and one-half inches in diameter from fire pump hereinafter provided for in this chapter; (5th) There shall be a pipe of not less than three-inch diameter connected to the sprinkler system and extending to the outside of the building with a Siamese steamer connection properly placarded and suitable Fire Department use, (6th) There shall be an approved system of local alarms with bell in the ticket office, a buzzer in the lobby and on the stage and a bell and annunciator in the basement or in the or engine room; all necessary gauges, in-cluding altitude gauge for tank riser, shall be located on main floor. Swing checks and gates shall be provided.
- (b) The entire sprinkler system and equipment and the location, installations and maintenance thereof, shall be subject to the approval of the Fire Marshal.
- 418. Fire Apparatus on Stage-Hand Fire Pumps—Fire Apparatus.) There shall be installed on each side of the stage a stand-pipe of not less than three inches in diameter with a hose connection at the stage floor and at each floor level above and below the stage, which standpipe shall be sup-

plied by a frost-protected gravity tank of a capacity of not less than 5.000 gallons. The bottom of said gravity tank shall be elevated at least twenty-five feet above the elevated at least twenty-live feet above the highest hose outlet and said gravity tank shall be equipped with a centrifugal power pump with hand controller, which power pump shall have a pumping capacity of not than three hundred gallons per minute against fifty pounds pressure at the stage roof, except in cases where an automatic roof, except in cases where an automatic pump is installed which shall comply with the provisions of Section 417 of this chapter, in which event such pump may be used as a source of supply for standpipes. In addition to the above requirements of this Section there shall be a pipe of not less than three inches in diameter connected to the standpipes and extending to the outside of the building and equipped with a Siamese steamer connection properly placarded for and suitable for fire department use. All gravity tanks shall be filled through not less than one and one-half inch connection from pump and shall be provided with gauges, swing checks and gate valves. Each standpipe shall have one and one-half-inch hose outlet above, below and on the stage. Such outlet shall be provided with a straightway hose and a valve and drop cock connection. A length of approved one and one-half-inch unlined linen hose shall be attached to each outlet, which said lines hose shall have a five-eighths of an inch smooth bore nozzle. All hose shall be mounted on self-releasing racks when not in use. The entire equipment shall be installed under the direction of and subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall he kept ready for use on and under the stage and in the flies, galleries and rigging loft. There shall be kent for use in every theatre of this class at least four fire department axes and six pike roles on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

- 419. **Hot Air Furnaces.)** The use of ordinary hot air furnaces or stoves in all theatres of Class V is prohibited. 419. Hot
- 420. Independent Lighting Exits—Red Light Over Exits.) All stairways and corridors shall be supplied with a supplementary lighting system of elec-tricity, gas or sperm oil, and such system shall be independent of all other lights in such building. The word "EXIT" shall appear in letters at least six inches high over the opening to every means of egress from such theatre and a red light furnished by gas or sperm oil, shall be provided over such sign.
- 421. Fire Alarm Apparatus.) theatre shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the city fire alarm telegraph and such other or places as the Fire Marshal shall direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.
- Dressing Room Partitions.) tions forming dressing rooms shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.
- 423. Capacity—Certificate for License.) (a) The Commissioner of Buildings shall determine the number of persons which each room used for the purpose of Class V may accommodate according to the provisions of this chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

(b) No license for the operation of a theatre shall be issued unless the Commissioner of Buildings, Fire Marshal and City Electrician shall first have certified in writing that such theatre complies with the provisions of this chapter in every respect.

424. Lighting Equipment.) Every room used for the purposes of Class V, and all outlets therefrom leading to the streets, inoutlets therefrom leading to the streets, including passageways, courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such room and spaces, and every passageway, court, corridor, stairway, exit, and emergency stairway, shall be provided with signs, indicating the way out of the huilding, the letters of which way out of the building, the letters of which shall not be less than six inches in height.

425. Lights—Control of Lights in Halls, Corridors and Lobbies—Separate Shutoff—Connections with Gas Mains—Independent Connections—Frotection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights—Ducts and Shefter Conducting Meated Air from Lights— Shafts Conducting Heated Air from Lights—Gas Stage Lights to Have Metal Screens.)
Gas and electric lights in the halls, corridors, lobbies or any other part of any theatre used by the audience, except the auditorium, shall be controlled by a separate shutoff located in the lobby and controlled in that particular place. Gas supplying such theatre shall have independent connections for the auditorium and stage, and provision shall be made for shutting off the gas from the outside of the building. Suspended or bracket lights sur-rounded by glass in the auditorium, or in any other part of the theatre shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceiling, or in any part of the theatre unless protected by fire-proof materials. The trough containing footlights shall be formed of and surrounded by fireproof material. Border lights shall be constructed according to the best known methods, and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire ropes. Ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between. Gas stage lights shall have strong wire metal guards or screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and shall be soldered to the fixtures in all cases

426. Fire Apparatus to Be Under Control of Fire Department.) The standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtains, switch boxes, ventilators controlling layers aver and silve older. tors, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against same, as provided for by this ordinance, shall be made and kept at all times in condition satisfactory to and under control of the Fire Marshal.

427. Scenery—Definition—Movable Scenery.) (a) "Scenery" as used in this chapter shall include all scenery, drop curtains, borders and wings which are constructed or made of cloth, canvas or combustible material, whether stationary or movable.

(b) "Movable Scenery" shall include all

(b) Movable Scenery shall include all scenery, drop curtains, borders, and wings which are made movable for the purpose of changing an entire set of scenery and substituting another set during or between the various stage acts.

428. Communication Between Box Office, Stage and Fly Galleries.) A system of tele-phonic communication, subject to the approval of the Commissioner of Buildings and the City Electrician shall be installed be-tween the box office, both sides of the stage, fly galleries, gridiron and space beneath the stage.

429. Changing from Class IV to Class V.) Whenever an existing Class IV theatre is changed into a Class V theatre, the same shall be made to comply with all of the provisions for Class V theatres hereafter 429. erected

## ARTICLE IX.

#### Class VI.

430. Class VI Defined.) In Class VI shall be included every tenement and apartment house or building or portion thereof, which is used or intended to be used as a home or residence for two or more families living in separate apartments.

Requirements-General.) building of Class VI shall comply with the provisions of this chapter, and in addition general provisions shall comply with the following special provisions:

432. Definition of "New Tenement House"
—"Apartment"—"Yard"—"Court"—"Shaft"
—"Public Hall"—"Stair Hall"—"Basement"
—"Cellar"—"Story"—"Solid Masoury".) (a) "New tenement house" shall include tenement, flat and apartment house hereafter erected and every tenement house which shall be increased or diminished in size or otherwise altered after its erection and every building now or hereafter in existence not now used as a tenement house but hereafter

converted or altered to such use.

(b) "Apartment" is a room or suite of two or more rooms occupied or intended or designed to be occupied as a family domicile.
(c) "Yard" is an open unoccupied space

(c) "Yard" is an open unoccupied space on the same lot with a tenement house, separating every part of every building on the lot from the rear line of the lot.

(d) "Court" is an open, unoccupied, unoccupied space.

obstructed space, other than a yard, on the same lot with a tenement house; a court entirely surrounded by a tenement house is an "inner court"; a court bounded on one side and both ends by a tenement house, and on the remaining side by a lot line is a "lot line court"; a court extending to a street, alley or yard is an "outer court."

(e) "Shaft" includes exterior and inter-

ior shafts, whether for air, light, elevator, dumb waiter or any other purpose; a "vent shaft" is one used solely to ventilate or light a water closet compartment, bath room, or pantry.

"Public Hall" is a hall, corridor or

passageway not within an apartment.

(g) "Stair Hall" includes the stairs, stair landings and those portions of the public halls through which it is necessary to pass in getting from the entrance floor to

top story.

(h) "Basement" is a story partly, but not more than one-half below the level of the street grade nearest the building.

(i) "Cellar" is a story more than one-half below the level of the street grade nearest the building. Where the grade of a street adjacent to a tenement house var-ies, the mean or average grade of such street opposite the lot containing the tenement

opposite the lot containing the tenement house shall be regarded as the grade of such street within the meaning of this chapter, (j) "Story" is that portion of a building between the top of any floor beams and the top of the floor or ceiling beams next above.

433. Sections—Where Conflicting With Other Sections.) In cases of direct conflict with the provisions of other sections of this ordinance relating to other classes, the pro-visions of the sections relating to Class VI shall govern in respect to tenement houses,

434. Changes or Alterations—Permits.) Every new tenement house and every change or alteration in any existing tenement house shall conform to the requirements of this chapter. No new tenement house shall be begun, nor shall any changes or alterations in any existing tenement house, such as are referred to in this chapter, be begun until a permit therefor shall have been issued by the Commissioner of Buildings. Such permit shall be issued only upon an application by the person, firm or corporation for the building is to be erected or altered, and after approval of the plans and specifications for such tenement house or for such changes or alterations by the Commissioner of Health whenever such approval is required by the ordinances of the City of Chicago.

435. New Tenement House—When to be Occupied.) (a) No new tenement house shall be occupied in whole or in part for human habitation until the issuance of a certificate by the Commissioner of Health that said building conforms to the requirements of this chapter relative to light and ventilation, plumbing and drainage applicable to said buildings, nor until the issuance by the Commissioner of Buildings of a certificate that the said building conforms to the requirements of this chapter relative to fire escapes and means of egrees applicable to new tenement houses. Within five days from date of application for any certificate above mentioned, such certificate shall be issued or the official concerned shall state in writing his reasons for his refusal to issue said certificate.

(b) The certificate above referred to may be issued in the case of a new tenement building comprising more than three apartments so as to allow the occupation of any section of the building extending from celar to roof in advance of the completion of the other portions of the building.

(c) When the outer walls of a new tenement house have been erected so as to outline the position of the courts and shafts required for the lighting and ventilation of habitable rooms, the owner of the building or his representatives shall be entitled, upon application in writing, to an inspection of the same by the Commissioner of Buildings, and if the work to that point is in compliance with the provisions regarding the size of shafts and the location of the building, to a certificate setting forth those facts.

(d) When the work of constructing partitions has advanced to a degree on any floor, that the rooms on that floor are determined in their dimensions, the owner or his representatives shall be entitled to an inspection from the Commissioner of Buildings, and if the rooms thus outlined conform in their dimensions to the plans filed and to the requirements of this chapter, to a certificate stating that fact.

(e) If a new tenement house is occupied as a place of habitation in any of its parts in violation of this section, it shall forthwith be subject to notice from the Commissioner of Buildings and shall be vacated upon such notice and shall not again be occupied until made to conform with the provisions of this chapter nor until after the issuance of the two certificates required in this section.

436. Plat to be Filed.) At the time of applying for a permit for the erection of, alteration of, addition to or moving of a tenement house or for the erection, alteration, adding to or moving of any building upon a lot upon which a tenement house stands, the applicant shall submit to the Commissioner of Buildings a plat of the lot, showing the dimensions of the same and the position to be occupied by the proposed building or by the building to be altered or added to or by the building to be moved thereon, and the position of any other building or buildings that may be on the lot. The measurements shall in all cases be taken at the top of the

first story and shall not include any portion of any street or alley.

437. Corner Lot Defined—Frontages.) By "corner lot" is meant a lot situated at the junction of two streets or of a street and a public alley at least sixteen feet wide, provided that if such alley be less than sixteen feet wide, and the lot be estimated on a line sixteen fect from the opposite side of the alley, such lot may be considered a corner lot. Any portion of the width of such lot distant more than fifty feet from such junction shall not be regarded as part of a corner lot, but shall be subject to the provisions of this chapter respecting other than corner lots. Where, in corner lots, the two frontages are of unequal length, the lesser street frontage shall be taken as the width of the lot. Street frontage alone, and not alley frontage shall be considered in determining such lesser frontage.

438. **Height—How Measured.)** (a) The height of a new tenement house shall not exceed by more than one-half the platted width of the widest street on which it abuts, and no existing tenement house shall be increased beyond such height.

(b) Provided, however, that any distance the building sets back from the lot line shall be added to the width of the street in making this computation. Such height shall be the perpendicular distance from the grade nearest the house to the highest point of the roof but shall not include as part of the roof any cornice or bulkhead less than eight feet high, or any elevator enclosure less than sixteen feet high. Where such street grade varies, the mean or average grade thereof opposite such house shall be the datum from which such height shall be measured.

439. Distance Between Buildings.) No existing tenement house shall hereafter be enlarged or its lot be diminished, so that the rear line of any building on such lot approaches nearer than ten feet to the rear line of the lot, unless the rear of the lot upon which it stands, abuts upon a public alley, in which case the rear line of such building shall be not less than sixteen feet from the opposite side of such alley. Where a tenement house, now existing or hereafter erected, stands upon a lot other than a corner lot, no other building shall hereafter be placed upon the front or rear of that lot, unless the minimum distance between such buildings be at least ten feet, if either building exceeds the height of one story; or fifteen feet, if either building exceeds the height of one story; but not the height of two stories; and so on, five additional feet to be added to such minimum distance of ten feet for every story more than one, in the height of the highest building on such lot.

440. Percentage of Area Allowed to be Covered.) No existing tenement house shall hereafter be enlarged nor its lot be diminished, nor other buildings be placed on its lot, nor a tenement house be moved on a lot on which there is an existing building, so that after such change a larger proportion of any corner lot or other lot upon which it is situated is covered by buildings, than the following proportions, respectively: No new tenement house alone or with other buildings now or hereafter erected, shall occupy above the first story more than eighty-five per centum of the area of a corner lot, provided that in the case of a fireproof building, in which the windows of every habitable room open directly on a street, the portion of the lot covered may be ninety per centum of the area of said lot, subject to the requirement that a ten foot space must be left above the first story opposite the lesser frontage; or more than ninety per centum of the area of such corner lot if such

corner lot is bounded on at least three sides by streets or alleys; or more than seventy-five per centum of the area of any other lot, provided that the space occupied by fire lot, provided that the space occupied by fire escapes, constructed and erected according to law and not more than four feet wide, shall be deemed unoccupied. Provided, however, that in case of a lot, triangular or irregular in shape bounded on two or more sides by a street and having a number of lineal feet street frontage exceeding one-twentieth of the number of square feet in the area of such lot, it shall not be necessary to comply with the conditions of this section as to percentage of lot which may be covered. be covered.

441. Must Have Alley or Yard in Rear—Size of Yard Increased.) At the rear of every lot containing a tenement house, there shall be a yard open and unobstructed from shall be a yard open and unobstructed from the earth to the sky, except by fire escapes not more than four feet wide, constructed and erected according to law, unless the rear of such lot abuts upon a public alley at least ten feet wide, in which case the rear line of such building shall be not less than 16 feet from the opposite side of such alley; every part of such yard shall be directly accessible from every other part thereof; such vard shall have an area of thereof; such yard shall have an area of at least eight per centum of the superficial area of the lot on corner lots except as otherwise provided in this section; and on other lots, such yards shall have an area of at least ten per centum of the superficial area of the lot. Every such yard shall be increased one per centum of the superficial area of the lot for every story above three stories in height of the tenement house sitnated thereon.

\*442. Courts—Inner—Outer—Lot Line.)
(a) "Inner courts" of all new tenement houses as defined in Section 432 of this ordinance, shall have minimum widths at every point and minimum areas as follows:

	Least width in feet.	in square feet.
	6	
3 stories	8	160
6 stories		
8 stories	or more.24	840

(b) The height of a court shall be the number of stories having habitable rooms with windows in its walls.
(c) "Outer courts" and "lot line courts" of all new tenement houses as defined in Section 432 of this chapter shall have minimum withs at every hoint equal to one. mum widths at every point equal to one-half of the minimum widths required by this hair of the minimum whether tenth are mini-mum areas equal to one-half of the mini-mum areas required herein for "inner mum areas required herein for courts."

ourts."

(d) The minimum widths hereinbefore specified for outer courts and the minimum widths and areas specified for lot line courts are to be provided irrespective of the presentation of courts on other

are to be provided irrespective of the presence of or dimensions of courts on other premises bounded by the same lot line.

(e) Every "inner court" and every "lot line court" of every new tenement shall be connected directly with a street, alley, yard, or outer court by an opening extending from grade at the building to a height of at least fifteen feet, and kept unobstructed save by an openwork grill or gate such opening to fifteen feet, and kept unobstructed save by an openwork grill or gate, such opening to be at least two feet wide for an inner court and one foot wide for a lot line court. In case of a three-story tenement on a lot twenty-five feet or less in width, a continuous lot line passage open to the sky, and six inches in width, shall be accepted for the opening specified above as one foot wide for a lot line court. If such inner

court or lot line court starts from any point above finished grade at building, such start-ing point shall be considered as grade for

ing point shall be considered as grade for purpose of determining the location of the opening to outer air herein specified.

(f) In case of a three-story tenement on a lot twenty-five feet or less in width a continuous lot line passage open to the sky, and at least three feet wide, shall be accepted in lieu of a lot line court or outer court hereinbefore specified in Paragraph (a). In case of a three-story tenement on a lot thirty feet or less in width, a continuous let line passage open to the sky, and at least three feet six inches wide shall be accepted in lieu of a lot line court or outer court hereinbefore specified in Paragraph (a).

\*Amended March 20 1911

\*Amended March 20, 1911.

(g) In case of a two-story tenement on lot twenty-five feet or less in width, a lot line court having an area of at least fifty square feet shall be accepted in lieu of a lot line court heretofore specified in Paragraph (a) of this section, and in case of a three-story tenement on a lot of twenty-five feet or less in width, a lot line court having an area of at least sixty square feet shall be accepted in lieu of a lot line court hereinbefore specified and required by Paragraph

(a) of this section.

(b) In case of two or three-story tenement buildings on lots twenty-five feet or less in width, where there is only one apartment on each story containing not more than four rooms in such apartment, the light courts hereinbefore specified in Paragraph (a) may be omitted, provided there is a continuous passageway open to the sky and not less than three feet wide on one

side of said building.

443. **Vent Shaft—Area Of.)** (a) "Vent shafts" of all new tenement houses, as defined in Section 454 of this ordinance, shall have minimum widths at every point and minimum areas as follows:

 
 Vent shafts
 Least width
 Least area

 Height of
 in feet
 in square feet.

 1 story
 3
 21

 2 stories
 3
 22½

 3 stories
 3
 27

 4 stories
 26
 stories ......6..... 7 stories ......8..... 8 stories or more.8.....120

(b) Every such vent shaft in every new tenement house more than two stories high, shall be connected directly with a street, alley, yard or court by one or more horizontal ducts or intakes at a level not lower zontal ducts or intakes at a level not lower than the finished grade of building nor higher than second story floor; the total area of such ducts to be not less than three per cent of the area of such vent shaft, and no single duct to be of less area than one lundred square inches; such total and individual duct area shall be net over and above all obstructions.

444. Stair Hall and Shaft—Well-Hole Dimensions.) (a) Every public stair half in every new tenement house shall, for each story, have a window of an area of at least twelve square feet, opening directly on a street, alley, yard or court; or on a shaft of minimum area, as hereinafter provided; or shall have an unobstructed vertical wellhole of the following minimum area at each floor line above the first, and, directly over such well-hole, there shall be a skylight of twice the following minimum area:

ding— Least area in square feet of stair shaft or well hole. 2 stories—if there is more than Building-Height of

one apartment on a floor..... 8 stories—if there is more than one apartment on a floor.....13 6 stories or more......38

- (b) Such window, if any, shall be so placed that light may pass directly to the opposite end of the hall, or else there shall be at least one window opening directly upon a street, alley, yard or court in every feet in length or fraction thereof twenty of such hall, except in so much of any entrance hall as lies between the entrance and the flight of stairs nearest the entrance. in any such public hall, recesses or returns, the length of which does not exceed twice the width of the hall, will be permitted, without an additional window, but, otherwise, each recess or return shall be regarded for the purposes of this section as if it were a separate hall. Any part of a public hall which is shut off from any other part by a door or doors shall be deemed a separate public hall within the meaning of this section.
- (c) Skylights shall be ventilating skylights and shall have over them a wire net-ting mounted on wire frame and 6-inch iron legs, of wire not lighter than No. 12 and with mesh not coarser than one inch by one inch, unless constructed of wired glass or prismatic light glass.
- 445. Rooms—Sizes and Height Of—Attic Rooms.) (a) In every new tenement house, all habitable rooms shall be of the following minimum sizes:
- (b) In each apartment, there shall be at least one room containing not less than one hundred twenty square feet of floor area. and every other room shall contain at least eighty square feet of floor area, provided, however, that in the case of a room having a window not less than eighteen feet in area opening upon a public street, the floor area need not be greater than seventy feet. Each room shall be in every part not less than eight feet six inches high from the finished floor to the finished ceiling; provided, however, an attic room need be eight feet six inches high in but one-half of its area, provided there are not less than 750 cubic feet of air space therein.
- 446. Alcoves and Alcove Rooms.) For the purpose of buildings of Classes III and IV, an alcove shall be defined as a recess connected with or at the side of a larger room. The floor of such an alcove shall be counted as a part of the floor area and its cubic contents as a part of the cubic contents of the room with which it is connected.
- (b) In every new tenement house every alcove shall be deemed a separate room for all purposes within the meaning of chapter, except an alcove that has a floor area of not to exceed thirty-five square feet and that has an unobstructed opening, equal in area to twenty per centum of its entire wall surface, into an adjoining habitable room; provided that in constructing additional habitable rooms by raising or altering existing one story dwellings, the limitation of the floor area of an alcoye may be disregarded, provided such alcove has an unobstructed opening, equal to the floor area of such alcove, into an adjoining habitable room.
- (c) This section shall not be construed as forbidding the crection of pilasters or other decorative effects projecting not more than eighteen inches from the plane of the wall of a habitable room.
- (d) No part of any room in a tenement house shall be enclosed or sub-divided at any time, wholly or in part, by a curtain, portiere, fixed or movable partition or other containers of the part of contrivances or device, unless each part of the room so enclosed or sub-divided shall contain a separate window as herein required, and shall have a floor area of not less than 80 square feet as herein required for hybitable rooms, except as heretofore provided in this section.

- 447. Air-Quantity of for Each Person.) No room in any tenement house shall be occupied so that the allowance of air to each adult person living or sleeping in such room shall at any time be less than four hundred cubic feet or less than two hundred cubic feet for each person under twelve years of age.
- 448. Habitable Rooms—Bath Rooms— Pantries—Requirement as to Ventilation and Lighting.) (a) In every new tene-ment house every habitable room shall have a window or windows with a total glass area opening onto a street, alley, yard or court. None of such required windows shall have a glass area of less than ten square feet, and each such window shall have its top not less than seven feet above the floor and shall be so constructed that at least its upper half may be opened its full width.
- In every new tenement house every (b) bath room, water closet, or urinal compartment shall have at least one window with a glass area of at least six square feet and a minimum width of one foot, opening upon a street, alley, yard, court or vent shaft.
- (c) In every new tenement house every pantry shall have at least one window of not less than six square feet in area, with a width of not less than one foot, opening into a street, alley, yard, court or vent shaft, which vent shaft shall be at least six square feet in area.
- 449. New Tenements-Habitable R.ooms in Basements—Prohibited in Cellars.) In no new tenement house shall any room in the cellar be constructed, altered, converted or occupied for living purposes; and no room in the basement of a new tenement house shall be constructed, altered, converted or occupied for living purposes unless such occupied for living purposes unless such rooms shall be at least eight feet six inches high in the clear and shall have at least one-half of such height above the finished grade of said premises at the building, and at least four feet three inches of such height above the average street grade at the building. ing.
- 450. Tenement Houses—Requirements for Fireproof and Slow-burning Construction. Every new tenement house more than five stories and basement high shall be of fireproof construction. Every new tenement house more than three stories and basement high, but not more than five stories and basement high shall be of slow-burning or fireproof construction. In case slowor fireproof construction. In case slow-burning construction be required, the cellar and basement construction, including the floor construction of the first story above the cellar or basement, shall be of fireproof construction.
  - Frame Tenement-Requirements.) \*451. In every new frame tenement house outside the fire limits, each suite of apartments shall be separated from the next suite in such building by a parti-tion of four-inch tile or of metal studding and metal lath, and the enclosing walls around the stairs, where there are two or more apartments on a floor, shall be of fireproof construction or sold masoury of the same dimensions as are required by Section 519.
  - \*Amended February 20, 1911.
- \*Amended February 20, 1911.

  \*452. Frame Additions to Frame Tenement Houses Within Fire Limits Not Permitted—Removal of Frame Tenement Houses.) No frame addition shall be permitted to any frame tenement house within the fire limits, either by adding to its height or its superficial area.

  If a tenement house, standing on wooden enterprise is moved to another left it shall
- supports, is moved to another lot, it shall not again be placed on wooden supports, but shall be placed on a masonry or concrete foundation.
- If a frame tenement house, not more than two stories high, is moved from one location to another upon the same lot, it may be set upon wooden posts and a basement or cellar not to exceed six feet six

inches in height from the floor to the ceiling thereof may be maintained thereunder, and no habitable rooms shall be constructed or occupied in said basement or cellar.

\*Amended July 8, 1912.

Entrance Halls-Solid Masonry-453. Exceptions-Ceilings.) Every main entrance hall in a new tenement house shall be at least three feet six inches wide in the clear from the entrance up to and including the stair enclosure and beyond this point at least three feet wide in the clear. In every new non-fireproof tenement house, except where there be only one apartment on each floor, such entrance hall shall be inclosed with solid masonry walls and with ceilings covered with incombustible material and shall comply with all the conditions of the following sections of this ordinance as to the construction of stair halls. If such main entrance is the only entrance to more than one flight of stairs, the several portions of coolerance is the several portions of coolerance below the several portions of coolerance and the several portions of th tions of such main entrance hall which separate the entrance of the building from the several flights of stairs, respectively, shall be increased respectively at least one foot in width for each additional flight of stairs.

454. Stair Halls—Construction Of.)
The stairs and stair halls in all new t ment houses more than three stories and basement or cellar high shall be constructed of incombustible material throughout, except that the treads of stairs may be of wood not less than one and three-eighths inches thick and all handrails may be of

hardwood.

(b) In every new non-fireproof tenement house all stair halls shall be enclosed on all sides with walls of solid masonry of the dimensions required by Section 519. All windows in stair halls, except where same open into a street, alley, outer court, or yard, shall have metal frames and sashes, glazed with wired glass. This section shall not apply to tenement houses which are not more than three stories and basement high

with only one apartment on each floor. \*455. Apartments Divided by Masonry.) (a) There shall be a wall of solid masonry of thickness as required by Section 519, extending from the ground to the roof between each set of apartness as required by Section 510, extending from the ground to the roof between each set of partments and around each court and each light shift, execpt as hereinafter provided; (a) provided, however, that a wall between apartments and extending from the main stair hall to the outer wall of the building may be offset at the second story floor line to some point nearer the center of the building, or of the group of aportments, to admit of an even distribution of space in the rooms adjacent to such wall, if such wall is supported at the second story floor line on firefroofed steel or tron beams which extend from the brick wall surrounding the main stair hall to the outer wall of the building; and provided, further, that such offset wall may be reduced to the thickness of eight inches, if supported at each floor line above the first story on firefroofed steel or iron beams carried by many walls as above specified; (b) and provided, however, that, in case there is a store or stores in the first story of a building of this class, a masonry dividing wall between apartments may begin at the second story floor line, if such dividing wall is subtorted on fivetroofed steel or iron browned the given begin at the second story floor line, if such divid-ing wall is supported on fireproofed steel or iron ing wall is supported on irreproofed steel or iron beams carried by masonry; and provided, further, that such dividing wall may be reduced to the thickness of eight inches, if supported at each floor line above the first story on fireproofed steel or iron beams carried by masonry. And provided that in buildings of fireproof construction the fartitions between apartments, and around stairs may be of burnt clay tile not less than three inches in thickness or re-inforced con-ercte partitions not less than three inches in thick-

(b) In buildings of ordinary construction two separate thicknesses of metal lath and fire-resistshall be used as fireproofing as reing plaster

and the purious from the section.

\*Amended February 20, 1911.

456. Ceilings Over Stores—Courts and Shafts Beginning Above First Story.) (a)

In évery new non-fireproof tenement house in which there is a store or stores in the first story, if the building is three stories or less in height, the portions of the first story ceiling directly under all public halls shall be of slow-burning construction, and if the building is four or more stories in height the entire basement and first story construction and the second story floor con-struction shall be of fireproof construc-

In every new non-fireproof tenement house the masonry walls enclosing every court or light or vent shaft beginning above court or light or vent snart beginning above the first story shall be supported on fire-proofed steel or iron beams carried by masonry or by fireproofed steel or iron columns; and such court or shaft enclosing walls may be reduced to the thickness of eight inches if supported at every intersect.

eight inches it supported at every intersecting floor line on fireproofed steel or iron beams carried as above specified.

457. Damp-Proofing—Basement Walls to Be Masonry—Cement Floor.) In every new tenement house constructed of brick or frame, the foundations and basement walls chell be built of measure constructed. shall be built of masonry or concrete not less than twelve inches in thickness, except as provided in Section 519 and shall have all outside walls below the adjacent ground level plastered on the outside with Portland cement or treated with other approved damp-proofing material, and such walls, as high as the ground level, shall be laid in cement mortar. The basement or cellar of every existing and new tenement house shall have a floor of Portland cement concrete not less than three inches in thickness laid on not less than six inches of sand or cinders.

\*458. Bay Windows—Courts—Vent Shafts.)
(a) The walls of every bay window and every court in masonry constructed new tenement houses shall be built of brick or other fireproof construction as required for

other mephod construction as required for exterior walls.

(b) The walls of every interior vent shaft in masonry constructed tenement houses shall be built of masonry or of five-proof material not less than four inches in thickness, supported by steel or iron.

\*Amended February 20, 1911. 459. **Porches.)** Where porches are constructed in courts of now existing or new tenement houses, the amount of area of un-obstructed space in such courts shall be exclusive of space occupied by stairs and porches. No additional rear porch shall be constructed on any existing tenement house in such way that the buildings on the lot with all their porches shall occupy a greater proportion of the lot than is permitted in proportion of the lot than is permitted in Section 440 of this chapter. No rear porch on any existing tenement house where the total area of buildings and all porches exceeds the proportion of the lot permitted in Section 440 of this chapter shall be reconstructed until the plan for such re-construction shall have been submitted to and approved by the Commissioner of Buildings. No rear porch built of combustible materials and more than eight feet in width, excepting stairways, shall be constructed on any new tenement house nor added to, nor reconstructed on any existing tenement house.

onstructed on any existing tenement house.

\*460. Flues and Chimneys.) In every building used for the purposes of Class I'I, the flues or chimneys shall conform to the following regulations: For one slove opening, the flue area shall not be less than forty-n ne square inches. For more than one stove opening and one furnace opening, the flue area shall not be less than seenly-seron square inches. All such flues shall be constructed according to the requirements of Section 584 of this chapter.

\*Amended February 20, 1911.

\*Amended February 20, 1911.

461. Bulkhead in Roof-Construction of -When Required.) There shall be in the roof of every new tenement house, unless the pitch of the roof thereof exceeds one foot rise in four foot run, at least one bulkhead or scuttle, fireproof or covered with fireproof material, with stairs or ladder leading thereto; no such roof opening shall be less than two feet by three feet. Where such tenement house is provided with rear stairs, there shall be a bulkhead or scuttle accessible from each of such rear stairs. No scuttle or bulkhead door shall have any look scuttle or bulkhead door shall have any lock on it but may be fastened on the inside by movable bolts or hooks.

Stairways-Width and Construction \*462. Stairways—Width and Construction of.) (a) Every now existing and every new tenement house shall have at least two flights of stairs, which shall extend from the entrance floor to the top story, and which stairs, shall be as far apart as practicable. One of said stairways shall be an interior stairway. Such stairs and the public halls in every tenement house shall each be at least three feet wide in the clear, and every apartment shall be directly accessible from both such flights of stairs without going through any other apartment. In a fiveproof building, both such nights of stars without going through any other apartment. In a firefroof building, where a public corridor serving two or more apartments, leads directly to a starway, such corridor and stairway will be credited as one of the two required stairways. If any existing tenement house be so altered as to increase the number of contribute them; or if each building ment house be so allered as to increase the number of apartments therein, or if such building be increased in height, or if the halls and stairs therein be damaged by fire or otherwise to an extent greater than one-half the value thereof, the entrance, stair halls, entrance halls and other public halls of the building so damaged shall be made to conform to the requirements of this Claster velving to near tenement louses. Chapter relating to new tenement houses.

\*Amended February 20, 1911.

(b) All enclosed stairs in every tenement house shall have at least one handrail, and where the width of such stairs is greater than 3 feet 6 inches, such stairs shall have a handrail on each side thereof. All open stairs shall be provided with suitable and substantial handrails on each side.

463. Stairs in Non-Fireproof Buildings, Eighty or More Rooms.) Every new non-fireproof tenement house containing over eighty rooms, exclusive of bath rooms, shall have one additional flight of stairs, over and above the flights hereinbefore provided for, for every additional eighty rooms, or fraction thereof; but if such building contains not more than one hundred and twenty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be at least one-half wider than is provided in this chapter.

464. Stairs in Fireproof Buildings, One Hundred and Twenty Rooms and Upward.)
Every new fireproof tenement house con-Exery new areproof tenement nouse con-taining over one hundred and twenty rooms, exclusive of bath rooms, shall have one ad-ditional flight of stairs, over and above the flights hereinbefore provided for, for every additional one hundred and twenty rooms or fraction thereof; but if such building contains not more than one hundred and eighty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building may be made at least one-half wider than is provided in this chapter.

465. Stairs—Entrance to—Treads and Risers.) Every flight of stairs required in a tenement house shall have an entrance on the entrance floor from a street or alley, or from a yard or court which opens into a street or alley. All stairs except rear stairs, in new tenement houses, shall have risers not more than seven and three-quarters inches high and treads not less than nine and one-half inches wide exclusive of nosings, except in winding stairs, where all treads at a point eighteen inches from the extrings on the well side shall be at least strings on the well side shall be at least nine and one-half inches wide, exclusive of

466. Fire Escapes.) Every tenement house four or more stories in height shall be provided with a fire escape or fire escapes, such as are required by this chapter. In every case each separate apartment shall have direct access to at least one such fire escape unless such apartment shall have direct access, without passing through any other apartment, to at least two separate flights of stairs leading to the ground, one of which is placed in front and one in the rear of such building, and one of which may be placed outside of the building; but where such separate apartment shall not have access to two such flights of stairs, then such apartment shall have direct access to a stairway fire escape. Every court in which there is a fire escape shall have direct and unobstructed access along the surface of the ground to a street or alley or to yard opening into an alley or street without en-tering into or passing through or over any building unless by a four foot wide fire-proof passage on the court or ground level. Except as herein specifically provided, the number, location, material and construction of fire escapes shall be controlled by the general provisions of this chapter on fire escapes.

467. Stairways and Fire Escapes to Be Free From Obstruction.) No obstruction of any kind shall at any time be placed before, upon or against any stairway, steps or landings or fire escapes in or upon any tenament bound. All fire escapes upon tenetenement house. ment houses shall be kept in good order and repair, and every exposed part thereof shall at all times be protected against rust by durable paint.

468. Shafts, Courts, Yards, Graded—Concrete—Drained.) In every now existing and new tenement house, the bottom of all shafts, courts or yards shall be provided with sanitary drainage and shall be graded or paved.

469. Access to Rooms—Otherwise than Through Bedroom.) In each apartment in every new tenement house, access to every living room and bedroom, and to at least one water closet compartment shall be had without passing through any bedroom.

470. Water Closets—Windows in—Artificial Light.) (a) In every new tenement house there shall be a separate water closet

house there shall be a separate water closet in a separate compartment within each apartment, except that where there are apartments consisting of only one or two rooms, in which case there shall be at least one water closet for every two apartments.

(b) Every water closet compartment in every existing tenement house shall be ventilated by such a window, or else by a vent shaft of at least one-half the minimum area required in Section 443. Every water closet compartment in every tenement house shall be provided with proper means of artificially lighting the same. If fixtures for gas or electricity are not provided in any such compartment, then the door thereof shall have ground glass panels or transoms.

471. Sinks—Requirements.) In every

Sinks—Requirements.) In every new tenement house there shall be in each apartment at least one kitchen sink with running water. In every existing tenement if there be not one such sink in each apartexisting tenement ment there shall be on every floor at least one kitchen sink with running water, ac-cessible to all the tenants of the floor, without passing through any other apartment. In no tenement house shall there be woodwork inclosing sinks; the space underneath sinks shall be left entirely open.

472. Fipes Through Floors—Catch Basins—Water Closets.) (a) In every new tenement house where plumbing or other pipes pass through floors or partitions, the openings around such pipes shall be sealed tight with plaster or other incombustible material, so as to prevent the passage of air or the spread of fire from one floor to another or from room to room.

(b) In the premises of a tenement house the catchbasin shall, whenever practicable, be placed in a court or yard, and shall be covered with a stone or iron cover, flush with the surface so that access to such basin shall be convenient.

(c) Where it is for any reason impracticable to place a catchbasin in a court or yard, the Commissioner of Health may authorize the use of an iron catchbasin with air-tight cover, located in the cellar or base-

- 4721/2. Buildings Damaged by Fire, Etc.) If any existing tenement house is hereafter damaged by fire or other cause, including ordinary wear, so that at any time its value be less than one-half its original value ex-clusive of the value of the foundations, such building shall not be repaired or rebuilt except in conformity with the provisions of this ordinance applicable to new tenement houses.
- 473. Provisions of this Article Not to Apply to Existing Buildings, Except Under Certain Circumstances—Then Commissioner to Notify.) (a) Nothing in this Article contained shall be construed as requiring alterations in the construction or equipment of buildings in existence at the time of the passage of this Article and which at the passage of this Article and which at the time of their construction were built in com-pliance with the ordinances then in force, unless they are in conflict with the requirements of Sections 447, 466, 471, 475, 476, 477, 468, or unless such buildings shall not have sufficient or adequate means of egress therefrom, by reason of insufficient or inadequate stairways, improperly located or insufficient or inadequate elevators or elevator equip-ment, doors, fire escapes, windows or other means of egress or ingress.

(b) Where it shall appear to the Commissioner of Buildings that any such building has insufficient means of egress therefrom as aforesaid, he shall notify the owner, agent or person in possession, charge or control of such building of such fact and direct him forthwith to make such alterations and changes in the construction or equipment of such building, as are necessary to be made in order to promote the safety of the occu-pants of such building and of persons using

the same and of the public.

474. Rooms and Halls—Additional.) Every room or hall that may hereafter be constructed or created in an existing tene-ment house shall comply in all respects with the provisions of this ordinance as to size, arrangement, light and ventilation of rooms and halls.

\*475. Rooms—Change in Existing.) No room in any now existing tenement house shall hereafter be constructed, altered, converted or occupied for living purposes, unless it contains a window having a superficial area not less than one-twelfth of the \*475. ficial area not less than one-twelfth of the floor area of the room, which window shall open upon a street or alley or upon a yard or court having a superficial area of not less than twenty-five square feet and a minimum width of not less than two feet six inches, or unless such room adjoins another room in the same apartment, which other room shall have such a window opening upon such a street, alley, yard or court, between which two adjoining rooms there shall be an alcove epcning equal in extent to at least 20 per cent of the entire wall surface of said room, provided, however, that all of the requirements of Sections 439 and 440 of The Chicago Code of 1911 shall be complied with.

Where a frame tenement house is moved from one lot to another, or from one location to another on the same lot, it shall comply with the provisions of Section 452 of this Chapter.

\*Amended July 8, 1912.

476. Windows—Courts—Attic.) No room in any now existing tenement house, which has no such window as aforesaid, opening upon a street or alley or upon a yard or court having a superficial area of not less than twenty-five square feet, shall hereafter be constructed, altered, converted or occu-pied for living purposes, unless it contains a floor area of at least sixty square feet and also at least six hundred cubic feet of and also at least six hundred cubic feet of air space; nor unless every part of the fin-ished ceiling of such room be at least seven feet six inches distant from every part of the finished floor thereof; provided, that an attic room need be seven feet six inches high in but one-half of its area, and, provided, further, that such attic room has not less than seven hundred fifty cubic feet or air space therein; and such attic room shall not be used for purposes of human habita-

tion other than as a sleeping room.

\*477. Existing Tenements—Living Rooms in Cellars or Basements—When Permitted.)
(a) In every existing tenement house, no room in an existing cellar or basement shall be occupied for living purposes unless such room shall be at least seven feet six inches from shan be at least seven feet six inches high in the clear, and have not more than four feet eight inches of such cellar or basement below the finished grade at building; provided that no such room shall be used for living purposes unless such room used for living purposes unless such room shall have a window opening upon a street, shall have a window opening upon a street, alley, yard or court, and, provided, that when the windows of any living room front solely upon a street and the floor of such basement is four feet eight inches below the sidewalk grade, such windows shall be the sidewalk grade, such windows shall be located not less than three feet back of the lot line; provided, however, that in every case where the height of celling of any living room is less than eight feet six inches in the clear, the window area of such room shall be at least 15 per centum of the floor

When a brick or frame tenement house is moved from one lot to another, or from one loca-tion to another on the same lot and a basement or story, or both, is constructed under the same, the or story, or both, is constructed under the same, the total height of which is more than six feet six inches from the floor to the ceiling, the walls of such basement shall be constructed of masonry according to the provisions of Section 688 of The Chicago Code of 1011, and the habitable rooms therein shall comply with the provisions of Section 475 of The Chicago Code of 1011, and the space on the lot shall comply with the provisions of Section 430 and Section 440 of The Chicago Code of 1011.

\*Amended July 8, 1912.

47732. Insanitary Conditions—Nuisance.) A tenement house or part thereof which is in an insanitary condition by reason of the basement or basement or cellar being damp or wet, or by reason of the floor of such basement or cellar being covered with stagnant water or by reason of the presence of sewer gas, or by reason of any portion of such building being infected with disease, or being unfit for human habitation, or which by reason of any other insanitary condition is a source of producing sickness among the inhabitants of this city, or which in any way endangers the public health, is hereby declared to constitute a public nuisance.

## ARTICLE X. Class VII.

478. Class VII Defined.) In Class VII shall be included every building used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as a department store.

478½. Must Comply With General and Special Provisions.) Every building of Class VII shall comply with the general provisions of this chapter, and, in addition 4781/2. to the general provisions, shall comply with the following special provisions: 479. Buildings of Class VII—Construc-tion of.) Buildings three stories or less

in height, used either wholly or in part for the purpose of Class VII, may be of ordinary construction. Such buildings more than three and not exceeding five stories in height shall be of slow-burning, mill or fireproof construction. Such buildings over five storics in height shall be of fireproof construction.

480. Stores Used for Retail Sale of Goods or Manufacturing Purposes—Occupation of Basement—Lockers.) (a) Not more than the lower twelve stories above the street grade shall be used for the retail sale of goods, or for locker provisions in excess of accommodations for the number of emaccommodations for the number of employes on the floor on which they are employed, or for manufacturing purposes in a building devoted wholly or in part to purposes of Class VII except as hereinafter provided; provided, however, the stories above the twelfth story may be used for these or other purposes when equipmed with these or other purposes when equipped with an approved outomatic sprinkler system apan approved outomatic sprinkler system approved by the Fire Marshal; and further provided, that all such buildings hereafter erected to be used for these purposes, or so used, above the twelfth story shall in addition to being equipped with an approved automatic sprinkling system have enclosed stairways. stairways.

(b) Not more than one floor of any basement or cellar shall be used for the retail sale of goods. Such floor shall be the nearest to the inside street grade. Such floor used for the retail sale of goods shall not be more than twenty feet below the inside

street grade.

(c) No sub-basement, cellar or part of a basement below such floor shall be used for the sale of any goods in any manner, but locker and dressing rooms may be placed in the sub-basement, provided the space thus occupied be separated from the remainder of the basement by fireproof partitions, and that there be at least two flights of stairs placed as far apart as practicable leading therefrom to the first floor, inclosed in fireproof partitions. Such stairs from such locker or dressing rooms shall be, in addition to other stairways required by this chapter for such buildings, and at least one of such stairways shall open directly on a street, alley or court opening on a street or alley, or on a fireproof passage leading to the street, alley or such court. Where more than five lockers are in one room, such lockers shall be of incombustible material.

(d) Where stories above the twelfth story are used for the purposes of Class VII as hereinbefore described for provisions in excess of accommodations for employes on the floor on which they are employed, then the stairways from the first to the topmost floor shall be built and inclosed as described in Section 668, but the stairways shall be in number and aggregate width as required in the table for stairways set forth in Section 666 of this chapter.

481. Floor Areas—Maximum.) (a) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class VII of any buildordinary construction shall not exceed nine thousand square feet.

(b) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class building of slow-burning or mill construction shall not exceed twelve thousand

square feet.

(c) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class VII of any building of fireproof construction shall not exceed 25.000 square feet, unless the building is completely equipped with an approved automatic sprinkler system, but in no case shall such area exceed 30,000 square 482. Floor Areas—Exceeding the Maximum Limits Defined in Section 481.) (a) Where any floor or portion of a floor used for the purposes of Class VII in any building shall exceed in area the maximum number of square feet allowed in the preceding section for the type of construction of such building in which such floor is contained, each such maximum amount of floor area so

each such maximum amount of floor area so used shall be separated from other parts of such floor by fire walls, or dividing walls built in accordance with the provisions of Section 250 of this chapter relating to dividing walls in buildings of Class I.

(b) Where any such floor so used is divided by such fire walls or dividing walls, each such division of such floor shall be provided with stairs, aisles, exits, and fire escapes as required in this chapter for separate and distinct buildings, and each such division shall be considered as a separate division shall be considered as a separate building, except as provided in Section 508 of this chapter.

483. Galleries.) (a) The area of any or all of the galleries, mezzanine or intermediate floors in any one story used wholly or in part for the purposes of Class VII in any building shall not exceed ten per centum of the area of such story. Galleries, mezzanine or intermediate floors of a larger size than the above shall be considered as full stories.

(b) Every gallery, mezzanine or intermediate floor shall have at least one stairway not less than three feet wide.

(c) The height from the floor of any gallery, mezzanine or intermediate floor to gallery, mezzanine or intermediate floor to the ceiling over same shall not be less than seven feet, and there shall be not less than seven feet of space between the bottom of such gallery, mezzanine or intermediate floor and the floor of the story in which such gallery, mezzanine or intermediate floor is placed.

(d) Every gallery, mezzanine or intermediate floor in any building used for the purposes of Class VII shall be built to conform to the construction applicable to such building, but galleries not exceeding five per centum of the area of such story, may be built of incombustible material without fireproof protection.

(e) No gallery, mezzanine or intermediate floor shall be built without a permit from the Department of Buildings, and plans showing the construction and size of such proposed gallery margain proposed gallery. mezzanine or intermediate

proposed galery, mezzanine or intermediate floor shall be filed with the Department of Buildings when a permit is applied for. 484. Courts of Class VII Buildings.) (a) Every court or light shaft of every building used wholly or in part for the purposes of Class VII shall be open and unobstructed from the bottom of such court to the sky, with the exception that fire escapes may be built therein, and such courts shall have walls constructed in the same manner as is required for the exterior walls of such buildings; provided, that no walls inclosing such courts are required on street or alley lot lines.

(b) All windows, doors or other openings in court walls of such buildings shall have metal frames, metal sashes and metal doors, with the glazed portions thereon of

wired glass.

485. Stories-Number of.) The first story above the inside street grade shall be designated and known as the first story for all purposes of this chapter, and the stories above shall be numbered consecutively, the second, third, and so on.

486. Stairs - Halls - Passageways Aisles—Signs and Lights.) (a) The stair halls, passageways and stair aisles shall be unobstructed and be as wide as the stair and not less than four feet wide in the clear.
(b) The exit door or doors between floors

and stair halls shall be not less than ninety per centum of the width of the stairway

to which they afford access, and for each elevator opening into such a stair hall, the doors to floors shall be increased six inches

in width.

(c) The stairways and stair halls of any building used wholly or in part for the purpose of Class VII shall be illuminated by gas or electric light, and the gas piping and gas or electric light, and the gas piping and the electric wiring shall be accomplished by piping and circuits separated and distinct from the general illuminating piping and circuits of the premises. Each stair light shall have a red glass inclosure.

(d) At the bottom of each such stairway there shall be an illuminated red glass sign with the number of the story in which it is situated inscribed thereon in letters not less than six inches high.

487. Aisles in Class VII Buildings.) (a) In buildings used wholly or in part for the purposes of Class VII there shall be aisles in such portions of the buildings as are used for such purposes, connecting the stair-ways and the elevators directly with the ways and the elevators directly with the street or alley doors, and such aisles shall be termed "main aisles." Such main aisles shall have a clear width equal to the width of the stairways connecting therewith, and for each elevator connecting with such an aisle there shall be an additional width of six inches, and no such main aisle shall be less than five feet wide in the clear between the counters in any department store or between the fixed seats therein. One-third the width of any basement stairway shall be added to the width of the main aisle connecting with such stairway.

(b) If there is a column in any such aisle, then the width of the aisle shall be increased by the width of such column.

- (c) If there is a counter, or counters, or settee, or any case, or other obstruction in an aisle, then that part of the aisle on each side of such counter, bench or case, or other obstruction shall be considered as a separate aisle. No aisle shall be less than three feet in width.
- 488. Exit Signs and Lights.) (a) All exits in buildings used wholly or in part for the purposes of Class VII shall be clearly indicated by illuminated red signs with the word "Exit" thereon in letters not less than six inches high. At the bottom of each stairway on the street floor level there shall be similar signs indicating the direction of be similar signs indicating the direction of the nearest exit to a street or alley.

(b) Fire escape doors or windows shall be indicated by illuminated red signs with the words "Fire Escape" thereon in letters not less than six inches high.

Doors at Street Level-Revolving \*489. Doors at Street Level—Revolving opons.) The clear width of the exit openings shall be computed in the same manner as that provided in this article for main aisles, and no door openings shall be less than five feet wide, and all doors shall swing outward. Revolving adoors shall not be considered as complying with this section unless the revolving wings of such revolving doors are so arranged that by the application of a force slightly more than is necessary to revolve said doors and which one person of ordinary strength is catable of exerting all sary to recover said abors and which one person of ordinary strength is capable of exerting, all the wings of said doors fold flat on each other and in an outward direction, or unless the re-volving wings of said revolving doors are so ar-ranged that they may be readily collapsed or reranged that they may be remain commerced on moved by pressure or simple mechanical means, to be approved by the Commissioner of Buildings and leave sufficient opening for two or ings, and leave sufficient opening for two or more persons to pass through with a minimum

more persons to fass through with a minimum width of not less than twenty-two inches on each side of said collapsed doors.

Where revolving doors are used as exits they shall be credited as exits only to the extent of the clear space remaining when the doors are collapsed, and all deficiency of required exits must be made up by additional doors.

\*Amended February 20, 1911.

490. **Doors in Dividing Walls.)** (a) Door openings may be built in dividing walls of such buildings; provided, however, that such door openings shall be not less than five feet in width and shall be provided with fire-proof doors built as described in Section 573 of this chapter, and that each door shall have an efficient closing device which will operate automatically in the event of a fire in close proximity to either side of such door

(b) Each such opening shall have exit signs and lights as provided for street doors and exit signs in Section 488 of this chap-There shall be aisles not less than five feet in width connecting with such doors from the main aisles, and in no case shall any such door be less than ninety per centum of the width of the aisle directly connect-

ing therewith.

491. Loads—Allowance for Live Loads in Construction of Floors of Buildings of Class VII.) For all buildings of Class VII the floor shall be designed and constructed in such a manner as to be capable of supporting, in addition to the weight of the floor construction, partitions, permanent fixtures and mechanisms that may be set upon the and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors, and shall be figured in accordance with Section 516 of this chapter.

#### ARTICLE XI.

#### Class VIII.

492. Class VIII Defined—Provisions of.) In Class VIII shall be included every build-ing used for school purposes and having a seating capacity of more than one hundred students.

492½. Must Comply With General and Special Provisions.) All buildings of Class VIII shall comply with the general provisions of this chapter wherever the same are applicable thereto, and in addition to the general provisions shall comply with the following special provisions:

493. Construction of.) (a) All build-493. Construction of.) (a) All buildings hereafter erected and used or intended to be used wholly for the purposes of Class VIII shall be constructed in accordance with the provisions of this chapter relating to Class VIII; and existing school buildings shall comply with the provisions of Class VIII with reference to stairs, exits and fire escapes.

(b) Buildings which have a seating capacity of two hundred or less and which are not over two stories and basement in height, may be built of ordinary construction; provided, that no portion of such build-ing shall be used for assembly hall purposes.

(c) Buildings which have a greater seating capacity than two hundred and not exceeding four hundred, and which are not over three stories and basement in height, shall be built of slow-burning or fireproof construction.

(d) Buildings which have a greater seating capacity than four hundred, or which are more than three stories and basement in height, shall be built entirely of fireproof

construction.

construction.

(e) Additions to existing buildings shall be built of the several types of construction required by this section; provided, however, that the sum total of the seating capacity of the entire building, including additions, shall be counted in determining the type of

shall be counted in determining the type of construction required for such addition.

(f) All alterations in existing buildings used for the purposes of Class VIII, other than new additions thereto, and intended to make them comply with the requirements of this chapter, may be executed in the same kinds of materials originally used in such buildings, unless otherwise distinctly provided herein.

- 494. Walls—Window Openings in.) No wall of any building used for the pur-poses of Class VIII and containing a window No opening shall be nearer than five feet to any lot line of adjoining property, street and alley lines not included.
- 495. **Fortable Frame Buildings.)** Portable frame buildings used wholly for the purposes of Class VIII, not larger than 28 by 36 feet and not over one story high, may be erected, provided exterior walls and roof of same are covered with metal or other incombustible material, and the interior woodwork painted with fire-retarding paint approved by the Commissioner of Buildings; and, provided, further, that the location of such buildings shall be approved by the Commissioner of Buildings. Such portable buildings shall not be located nearer than ten feet to any other building, and shall not he maintained on any one lot or block for a longer period than two years after the date of the issuance of the original permit.
- 496. Assembly Halls—Limitations as to Seating Capacity and Floor Level.) (a) The limit of height at floor level and the maximum seating capacity of assembly halls or auditoriums or other single rooms in buildings of this Class must not exceed the numbers gives in the following table. bers given in the following table, for the specified type of construction, to-wit:

-Type of Construction-

Slow burning or Mill Constructtion Having Fireproof

Stairs Ordinary Floor-Fireproof Height of and Construc-Above Grade. Construction, Corridors, tion, Persons, Persons, Persons.

500 Over 60 ft.... 100 60 ft. or less.. 45 ft. or less.. 600 300 . . . 700 500 1000 800 30 ft. or less.. 20 ft or less.. 10 ft. or less.. 5 ft. or less.. 1500 900 500 2000 1000 800 2500 1200

All assembly halls or other single rooms having a seating capacity larger than that given in the above table must have the part of the main floor within not more than one foot of grade level and must have exits leading directly to three streets, public alleys, or to open public grounds.

Seating capacity of all assembly halls (c) in buildings of this Class shall include the total aggregate seating capacity of all balconies, gallerics, stages and platforms as well as the main portion of such assembly hall or rooms.

(d) Heights of assembly hall floors shall he measured from sidewalk level at en-trance of building or open school grounds to highest part of main floor of such assembly hall or rooms.

497. Stairways—Width of.) (a) Stairways in buildings used for the purposes of Class VIII shall be equivalent in width to fifteen inches for every hundred of seating capacity in such building as measured by the aggregate seating capacity of the auditrie aggregate seating capacity of the atomic terium, assembly rooms and school rooms; provided, however, that the number of per-sons allowed in such buildings at any one time shall be limited by the width of stair-ways available as exits therefrom.

(b) No stairway shall be less than four feet in the clear, except where more than two stairways lead down from any floor, in which case stairways three feet in width in the clear may be counted in the total

width of stairs required.

(c) Where two or more stairways are used, they shall be placed at opposite ends of the building or as far apart as practicable, and all such buildings hereafter erected shall have at least two separate and distinct stairways from the ground floor to the top floor, and all existing buildings shall have two such separate and distinct stairways, or one stairway and one sliding or stairway fire escape.

- or stairway fire escape.

  (d) All stairways shall have railings on each side thereof. No stairway shall ascend a greater height than thirteen feet six inches without a level landing, the dimensions of which, in the direction of the run of the stairs, shall be not less than four feet, or which, if at a turn of the stairs, shall be of not less width than the width of the stairs. No winder shall be permitted in any stairs. Stairways which are over nine feet wide shall have double intermediate handrails with end newel posts at least five and one-half feet high. All stairways shall discharge at the bottom directly ways shall discharge at the bottom directly to a public thoroughfare or open ground.
- 498. Stairways in Buildings Hereafter Erected—Fireproof.) In buildings herealter erected more than two stories and basement in height, the stairways and their enclosing walls shall be of fireproof construction.
- 499. Width of Corridors, Passageways, Hallways and Doorways.) The width of corridors, passageways, hallways and doorways shall be equivalent in width to eighteen inches for every one hundred of seating capacity of such portions of building as will be required to use same for exit. No corridor, passageway or hallway shall be less than five feet in width, and no doorway less than three feet in width, except where two or more doors, each two feet eight inches or more in width, are grouped together.
- 500. Doors to Open Outward—Covering of.) All doors in such buildings shall open outward, and all entrance and exit doors shall be unlocked at all times when the shall be unlocked at all times when the building is occupied for school purposes, or open to the public. All exit doors from assembly halls to other parts of the building shall be covered with metal or other fireproof material approved by the Commissioner of Buildings.
- 501. Aisles—Width of—In Assembly Halls and Recitation and Study Rooms Must Be Kept Clear of Obstructions.) (a) Aisles in Assembly halls in such buildings shall be equivalent in width to eighteen inches for every one hundred of seating capacity in such assembly hall, but no such aisie shall be less than two feet six inches wide in its marrowest part. All groups of seats shall All groups of seats shall narrowest part. harrowest part. An groups of seats snan be so arranged that they shall have an aisle on each side, and not more than twelve seats in any one row shall be placed between aisles.

tween alsies.

(b) Aisles in class rooms, recitation rooms and study rooms of such buildings shall be equivalent in width to eighteen inches for every one hundred permanent seats in any such room, but no aisle shall be less than eighteen inches in width and no less than sixteen inches in width and no main to cross aisle be less than two feet six inches in width.

(c) All aisles and passageways in such (c) All aisies and passageways in such buildings shall be kept free from camp-stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any such aisle or passageway during any performance, service, exhibition, lecture, concert or any public assemblage.

502. Emergency Exits for Assembly Rooms—Aggregate Width of.) All assembly halls of such buildings having a seatbly halls of such buildings having a seating capacity of eight hundred or more shall be provided with at least two emergency exits. The aggregate width of such emergency exits, which shall be provided for each floor, balcony or gallery of such assembly hall, shall be not less than nine inches in width for every one hundred of seating capacity or portion thereof. No emergency exit or stairway shall be less than three feet in width. Emergency exits must be located as far apart and as far from main exits as practicable, subject to the approval of the Commissioner of Buildings.

- 503. Exits Signs.) All exits opening from assembly halls of such buildings shall have the word "EXIT", in letters at least six inches high, applied to the auditorium side of every such exit, and when such assembly hall is in use at night, a red light shall be kept burning over the word "EXIT" during the entire time and until the pupils and audience have left the building.
- 504. **Lights in Buildings—Windows— Skylights.)** (a) Every portion of any such building devoted to the uses or accommodation of the public and all outlets therefrom leading to the streets, including the open courts and corridors, stairways, and exits, shall be well and properly lighted during the entire time such portion is in use, and shall remain lighted until all the pupils and the audience have left the premises.
- All gas or electric lights in the class (b) (b) All gas or electric lights in the class rooms of main building and in halls, corridors, lobbies, stairs and exits leading from the assembly halls shall be independent of lights in assembly hall. By "independent" shall be construed a separate pipe from meter or separate circuits from switchboard
- (c) The total glass area of outside windows and skylights of each class room, recitation room or study room in such buildings shall be not less than one-fifth of the floor area of such room.
- (d) Class rooms, recitation rooms and study rooms that have exterior windows on one side only must have the top of glass in such windows at a height above the floor of such room of not less than one-half of the distance to the opposite parallel wall or partition.
- (e) Such rooms having exterior windows on two opposite sides of the room shall have the top of glass in such windows not less than one-fourth the distance between walls in which the windows are placed. The height of windows in corner rooms having windows in adjacent walls shall be computed from nearest wall or partition to opposite window.
- (f) Where skylights or skylights and windows of sufficient size to give the proper glass area are used these heights of windows shall not be required.
- 505. Scenery-Sliding Curtains-Screens-Fireproofing Same-Hand Pumps-Fire Extinguishers.) No curtains or scenery shall be used in any assembly hall, excepting only, that it shall be permissible to use a pair of sliding curtains hung on horizontal metal rods not over twelve feet above the floor of stage and portable screens set on the floor and not over eight feet high. Screens used exclusively for stereopticon purposes shall not be construed as curtain or scenery. All screens, curtains, draperies and scenery so used shall be treated with a fire-retarding solution, and at least one hand pump or chemical fire extinguisher shall be provided and kent in a constant. The use of gas calcium lights is prohall
- 506. **Basement When Used for C Rooms.)** (a) In every such building for Class which the lower or basement floor is below surface of the ground surrounding such building, and is used in part or as a whole for heating or ventilating apparatus, such floor shall be considered the basement story of such building.
- recitation (b) Class rooms, study rooms shall not be allowed in basements less than twelve feet in height in the clear nor where the floor is more than two feet below the level of the sidewalk at

nearest entrance of building nor in baséments which are not properly lighted by windows or skylights as defined elsewhere in this Chapter for such rooms.

507. **Stories—Height of.)** No story above the basement shall be less than twelve feet in height in the clear.

\*508. Fire Escapes.) (a) Every building used for the purposes of Class VIII of four or more stories in height shall be provided and equipped with stairway fire escapes or slding fire escapes as herein provided.

\*Amended February 20, 1911.

(b) All such buildings having a seating capacity of less than two hundred on any one floor above the second floor shall have at least one such fire escape.

(c) All such buildings having a seating capacity of over two hundred but less than four hundred in any one story above the second floor shall have at least two such fire escapes.

(d) All such buildings having a seating

capacity of more than four hundred but less than six hundred on any floor above the second floor shall have at least three

such fire escapes.

(e) At least one additional stairway or sliding fire escape shall be provided for every increase of two hundred seating capacity in any one story above the second

(f) Stairway fire escapes shall be built in accordance with the requirements of Sections 669, 670 and 673, and shall be subject to the approval of the Commissioner of Buildings.

Sliding fire escapes shall be securely (2) (g) Sliding fire escapes shall be securely anchored or fastened to the building and shall have a radius or width of not less than thirty-six inches, and the inner side of the same shall be entirely smooth and made of metal. There shall be an entrance to each sliding fire escape from each floor above the first story. They shall be of a pitch of not less than thirty degrees you pitch of not less than thirty degrees nor more than forty-five degrees for straight runs. They shall be so constructed that they will discharge people not more than twenty-four inches from the adjacent ground or floor. They shall be of such pattern and design as will best secure the safety of the public, and their construction, location and maintenance shall be subject to the approval of the Commissioner of Buildings. Spiral sliding fire escapes shall have two complete turns for each story height of

more than thirteen or less than sixteen feet.
(h) All the provisions of this Chapter relating to outside sliding or stair fire escapes shall apply to buildings of Class Which case interior fire escapes from ground which case interior are escapes from ground to roof may be substituted for exterior fire escapes, provided such interior fire escapes shall comply with each and all of the following conditions:

(i) Interior fire escapes in fireproof

(i) Interior fire escapes in fire buildings shall be enclosed in brick or crete walls on all sides from top to bottom, and shall be enclosed at the top with a fireproof penthouse. The treads and risers of such interior fire escapes shall be the same as those used for stairs elsewhere in the building and the width of such fire escapes shall not be less than forty inches in their

shall not be less than forty inches in their narrowest part between hand rails.

(j) The landings of such fire escapes shall, exclusive of and in addition to the space covered or occupied by swinging doors, be at least equal to the stairs in width. All doors leading to such fire escapes shall be incombustible doors and the glass portion thereof shall be glazed with polished wired glass not less than one-quarter of an inch thick, which shall be large enough to enable persons to see be large enough to enable persons to see other persons on the opposite side of the door. The combined width of said doors

on each landing shall exceed the stair width twenty-five per cent, but no single door shall be more than three feet wide. They shall be hinged and equipped with autopen outward. Windows lighting such fire escapes shall have metal frames and sash

and wired glass.

(k) The number and capacity of such interior fire escapes shall in no case be less than is elsewhere in this Chapter required for outside fire escapes, and the locations of the same shall be as far apart as practicable and so placed as to best secure the safety of the persons using the same in case of ire, accident or panic.
(1) Such interior fire escapes which com-

with all the conditions above enumerated may be used daily as ordinary stairs.

509. Inspection—Duties of Engineer-President of Board to Report to Fire Marshal.) (a) It shall be the duty of the engineer of every building used for the purposes of Class VIII under the control of the Board of Education of this city, where an engineer is employed, or, in case no engineer is employed at such building, it shall then be the duty of the janitor of such building to examine all fire escapes on such buildings from the topmost story to the ground and to examine and operate all doors, windows and platforms leading to and from such fire escapes at least once each and every week that such building is used for school purposes, and to make a written report of such examination to the President of the Board of Education, showing the time it was made and the condition the fire escapes.

(b) It shall be the duty of the President of the Board of Education to make a written of the Board of Education to make a written report to the Fire Marshal at least three times a year, showing all such examinations made and the condition in which all fire escapes were found at the time of inspection; also the condition of the doors, windows and platforms leading to and from

such fire escapes.

(c) It shall be the duty of the person in charge of each building used for the purposes of Class VIII, other than school buildings under the control of the Board of Education of this city, to make an examination of the fire escapes on school buildings under their charge, from the topmost story to the ground, and to examine and operate all doors, windows, and platforms leading to or from such fire escapes at least once each and every week that such building is used for school purposes, and to make a written report to the Fire Marshal at least three times each year, showing all such inspec-tions made and the condition in which fire escapes, doors, windows and platforms were found at the time of the inspection.

Such fire escapes shall be kept in good condition, ready for immediate use at any and all times that such building is in use and shall be kept free from snow and

(e) The duties herein imposed by this Section shall not be held to relieve the Fire Marshal or Commissioner of Buildings from performing such duties as are otherwise required of them by this Chapter.

510. Fire Drill-Written Report to Fire Marshal.) (a) The principal or other Marshall (a) The principal of other person in charge of the pupils of every building used for the purposes of Class VIII shall establish and maintain a good and efficient fire drill, which shall be practiced at least twice every month during the time such building is used for school purposes.

(b) A written report shall be made by the principal or other person in charge of the pupils in all school buildings under the control of the Board of Education of this city to the President of said Board of Education of each fire drill held and of the time that elapsed from the first fire signal until the last person was out of the building. (c) It shall be the duty of the President

of the Board of Education to make a written report to the Fire Marshal at least three times each year, which report shall contain a record of all such fire drills practiced in

a record of all such fire drills practiced in each of the school buildings under the control of the Board of Education of the city.

(d) It shall be the duty of the principal or other person in charge of school-buildings, other than those under the control of the Board of Education, to make a written report to the Fire Marshal at least three times each year, showing a record of each fire drill held and the time that elapsed from the first signal until the last person was out of the building.

was out of the building.

(e) The duties herein imposed in this Section shall not be held to relieve the Fire Marshal or Commissioner of Buildings from performing such duties as are other-wise required of them by this Chapter.

The Commissioner of Buildings, the 511. Fire Marshal, City Electrician and Superintendent of Police Shall Close Buildings for Violations.) The Commissioner of Build-Violations.) The Commissioner of Buildings, Fire Marshal. City Electrician and Superintendent of Police, or any of them, shall have the power to close or order closed any building used wholly or in part for the purposes of Class VIII wherein there is any violation of the provisions of this ordinance, and to keep the same closed until such provisions are complied with.

#### ARTICLE XII. General Provisions.

Construction or Alteration of Building — Requirements.) Every building or structure or part thereof, hereafter constructure or part thereof, hereafter con-structed, erected, altered, enlarged, repaired or changed within the City shall be so constructed, erected, altered, enlarged, repaired or changed, in accordance with the proor changed, in accorda visions of this Chapter.

513. Class of Buildings Not to Be Changed Without Conforming to Provisions of This Chapter.) If buildings, the uses of which bring them within any of the classes mentioned in this Chapter, are to be applied to the uses of any other class for which a better system of construction is required by this Chapter, the construction and equip-ment of such buildings shall first be made to conform to the requirements of this Chapter as specified for their intended use. it shall be unlawful to use any such building for a new or different purpose from that to which its structure and equipment adapts it under this Chapter, unless the require-ments of this Chapter for such new or dif-ferent use shall first have been complied with, and a permit for such alteration or use shall have been first obtained from the Commissioner of Buildings.

514. Alterations of Existing Buildings.)

1) In construing the several sections of this Chapter, said sections shall not be construed as requiring alterations in the construction or equipment of buildings or structures in existence at the time of the passage of this Chapter, except where specifically provided, unless such buildings shall not have sufficient or adequate means of egress therefrom or ingress thereto, by reason of insufficient or inadequate stairways or stairways improperly located or insufficient or inadequate elevators or elevator equipment, doors, fire escapes, windows or other means of egress or ingress and except also in sections which are herein

made retroactive.
(b) Whenever an Inspector of Buildings shall make a report to the Commissioner of Buildings that any such building has in-adequate or insufficient means of egress therefrom or ingress thereto, as aforesaid, the Commissioner of Buildings shall notify the owner, agent, or person in possession, charge or control of such building of such fact and direct him forthwith to make such alterations and changes in the construction or equipment of such building as are necessary to be made in order to make such building comply with the requirements of this Chapter.

- (c) If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing building, or to make a change in its use or occupation which will transfer it from one class as recognized by this Chapter to another class, then, before such enlargement or structural change or modification of building is made, or before such change in its use or occuor before such change in its use or occupation may be made, written notice shall be given to the Commissioner of Buildings of the intention to change the character of the use, and the entire building shall be reconstructed or modified in such manner as to bring the same, when enlarged or altered, or when occupied for its new and different purposes, into compliance with the different purposes, into compliance with the provisions of this Chapter.
- \*515. Removal of Brick, Stone, Frame or Concrete Buildings.) It shall be unlawful for any person, firm or corporation to move any brick, stone, frame or concrete building from one location to another, unless the for any any bri from one location to another, unless the same shall be altered or re-constructed so as to conform to the ordinances governing the construction of such building at the time of moving the same and in its new location; provided, however, that whenever a tenestation of the same and ment house is moved, nowever, that whenever a tenement house is moved, the same shall be made to comply with the requirements of Section 475 and Section 477 of The Chicago Code of 1911, as amended.

\*Amended July 8, 1912.

516. Live and Deal Loads—Wind Resistance.) (a) The "dead load" shall include all permanent portions of the building, also

permanent permanent fixtures and permanent fixtures and mechanisms supported by the building.

(b) All buildings shall be designed to resist a horizontal wind pressure of 20 lbs. per square foot for every square foot of exposed surface. In pressure square foot of exposed surface. posed surface. In no case shall the over-turning moment due to wind pressure ex-ceed seventy-five per cent of the moment of stability of the building due to the dead load only.

load only.

(c) The "live" loads per square foot of floor areas, except stairs, for the classes of buildings except portions of Class VIII as hereinafter provided shall be not less than

the following:

Pounds. Class I...... 100 Class II.
Class III.
Class IV. 50 40 100 Class 100 4.0 100 Class VIII.....

- (d) Provided, however, that in Class VIII the portions of the building exclusive of the floors in assembly halls, the corridors and the stairs, shall not be required to be constructed to support a live load in excess of 40 pounds per square foot.
- (e) The roofs of all buildings shall be designed and constructed in such a manner that they will bear a load in addition to the weight of their structure and covering, of at least twenty-five pounds for each square foot of horizontal surface.
- (f) The live loads on stairways for buildings of all classes shall not be less than 100 pounds per square foot of treads and land-
- \*517. Structural Details—Strength Tests—How Made.) (a) All structural details and workmanship shall be in accordance with accepted engineering practice, and subject to the approval of the Commissioner of Buildings.
- (b) Floors, joists and beams shall be designed for the full dead and live loads. Floor girders shall be designed for the full dead and not less than eighty-five per cent of the live load.
  - (c) In buildings of Classes III and VI, except frame buildings, where the distance between enclosing walls or intermediate walls is more than twenty-five feet in the clear, intermediate supports for the joists shall be either brick, or concrete, or iron, or steel columns, beams, trusses, or girders.
  - \*Amended February 20, 1911.
- (d) If brick walls are used for this purpose, they may, in all cases where the thickness of walls is given, in Section 519, as 16 inches or more, be made four inches less in thickness than the dimensions stated.
- (e) Tests shall be made by the owner, upon the demand of the Commissioner of Buildings, on all forms of floor construction involving spans over eight feet. Such tests shall be made to the approval of the Commissioner of Buildings, and must show that the construction will sustain a load equal to twice the sum of the live and dead loads, for which it was designed, without any in-dication of failure. The construction may dication of failure. The construction may be considered as part of the test load. Each test load shall remain in place at least twenty-four hours. On arch construction, this test load shall be placed on one-half of the arch, covering the area from the support to the crown of the arch.
- 518. Walls, Fiers and Columns—Dead and Live Loads.) (a) The full live load on roofs of all buildings shall be taken on walls, piers, and columns.
- The walls, piers and columns of all buildings shall be designed to carry the full dead loads and not less than the proportion of the live load given in the following table:

Floor17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1785	per	cent.														
1680	85															
1575	8.0	85														
1470	75	8.0	85													
1365	70	75	8.0	85												
1260	65	7.0	75	8.0	85											
1155	60	65	7.0	75	80	85										
1050	55	60	65	7.0	75	80	85									
9	5.0	55	60	65	70	75	80	85								
850	50	50	55	60	65	70	75	8.0	85							
750	5.0	5.0	50	55	6.0	65	7.0	75	8.0	85						
650	50	50	50	50	55	60	65	7.0	75	8.0	85					
550	5.0	50	50	50	50	55	60	65	7.0	7.5	80	85				
450	50	50	50	5.0	50	50	55	60	65	7.0	75	8.0	85			
350	50	50	50	50	50	50	50	55	60	65	70	75	80	85		
2	50	50	50	50	50	50	50	50	55	60	65	70	75	8.0	85	
150	50	50	50	50	50	50	50	50	50	55	60	65	70	75	80	85

(c) The proportion of the live load on walls, piers, and columns on buildings more than seventeen stories in height shall be

taken in same ratio as the above table.

(d) The entire dead load and the percentage of live load on basement columns piers and walls shall be taken in determin-

ing the stress in foundations.

In addition to the entire dead loads, not less than the following proportion of the percentage of live load on the basement columns, piers and walls shall be taken in determining the number of piles for pile foundations and the area of concrete

In all foundations eccentric loading must

\*519. Thickness of Walls and Columns—Construction—Width—Height.) (a) Brick, stone, and solid concrete walls, otherwise provided, shall be of the thickness in inches indicated in the following table: one-story brick buildings and in the second story of two-story brick buildings of said last mentioned classes where said eight-inch walls are not more than fourteen feet in height and are supported by a foundation or wall not less than twelve inches in thickness.

A brick wall not more than twenty-(h) five feet long and forming one side of a brick shaft for stair, elevator or other purposes, need not exceed sixteen inches in thickness nor its upper fifty feet twelve inches in thickness, provided that in no case shall the load on such brick wall exceed the safe load for brickwork prescribed by this ordinance

(i) The length of a wall shall be the distance in which the walls extends in a straight line and shall be measured between angles of the masonry or between exterior cross walls.

(j) Where masonry buttresses or piers or pilasters are employed on either or both sides of a wall, then said walls may be reduced in thickness by one-half of the pro-

Base-						– Sto	ries -					
ment.	1	2	3	4	5	6	7	8	9	10	11	12
One-story	12											
Two-story	12	12										
Three-Story	16	12	12									
Four-story	20	16	16	12								
Five-story24	20	20	16	16	16							
Six-story24	$^{20}$	20	$^{20}$	16	$^{16}$	16						
Seven-story24	$^{20}$	20	20	$^{20}$	16	16	16					
Eight-story24	$^{24}$	$^{24}$	20	$^{20}$	$^{20}$	16	16	16				
Nine-story28	$^{24}$	$^{24}$	$^{24}$	$^{20}$	20	$^{20}$	-16	16	16			
Ten-story	28	2.8	24	$^{24}$	$^{24}$	$^{20}$	$^{20}$	$^{20}$	$^{16}$	16		
Eleven-story28	28	28	$^{24}$	$^{24}$	$^{24}$	$^{20}$	$^{20}$	$^{20}$	16	16	16	
Twelve-story32	$^{28}$	28	28	$^{24}$	$^{24}$	24	$^{20}$	20	20	16	16	16

In Class VIII buildings the thickness of surrounding walls and of all divid-ing walls carrying loads of floors and roof shall be as indicated in the following table, to-wit:

В	ase-		—St	orie	s	
m	ent.	1	2	3	4	5
	in.	in.	in.	in.	in.	in.
One story	16	12				
Two stories	16	16	12			
Three stories	16	16	16	12		
Four stories	20	$^{20}$	16	16	12	
Five stories	$^{24}$	20	20	16	16	16

(c) In Class VIII buildings, walls around elevators and air shafts and joist supports shall comply with the r ments of Section 641 of this Chapter. with the require-

(d) The basement walls of two-story buildings and the first story walls of three-story buildings in Classes III and VI may be twelve inches in thickness. The first d VI may The first walls of one-story buildings and the second story walls of two-story buildings in Classes III and VI may be eight inches in thickness, provided that where a pressed brick fee is used. In thickness, province that where a pressure brick face is used no wall shall be less than twelve inches in thickness, and an eight-inch brick or solid concrete partition wall may be built in a building of any class, but in no case shall any eight-inch brick wall

be more than fourteen feet in height.

(e) The basement walls of two-story buildings in Classes II, III and VI may be

inches in thickness.

In buildings of skeleton fireproof construction, the thickness of walls shall be governed by Section 623 of this Chapter. (g) Walls less than fifty feet in length and walls less than fifty feet between cross

and walls less than fitty feet between cross walls, may be built four inches less in thickness than the thickness given in the aforesaid table, but no such wall in such buildings shall be less than twelve inches in thickness, provided, however, that such walls in buildings of Classes III and VI may be sixty-five feet in length; and further provided, that eight-inch walls may be used in

jection or projections of the buttresses or piers or pilasters. The reduction in thickness may be made throughout the height of the wall, except that no 12-inch wall shall be higher than thirty feet and no 16-inch wall shall be higher than fifty feet. The stress in the brick work in any part of such walls shall not exceed the stress per square inch allowed by this Chapter on the kind of masonry employed. Buttresses or piers or pilasters shall be at least one-tenth as wide as the spacing between the buttresses or piers or pilasters. Twelve-inch walls or less between buttresses or piers or pilasters shall not be used where the distance between buttresses or piers or pilasters is greater than eighteen feet. Sixteen-inch greater than eighteen feet. Sixteen-inch walls or less shall not be used between buttresses or piers or pilasters where the distance is greater than twenty-four feet between buttresses or pilasters. Twenty-inch walls or less shall not be used between buttresses or piers or pilasters where the distance is greater than thirty feet between luttresses or piers or pilasters. buttresses or piers or pilasters.

(k) Where buttresses are used, they shall

be so placed that the principal girders and trusses shall bear on them. (1) If the loads carried by trusses and girders are supported by iron, steel, or reinforced concrete columns, then such butinforced concrete columns, then such but-tresses as are herein described shall not be required except for the fireproofing of steel and from columns. The walls between such columns shall be built as required by this Chapter, and said walls shall be anchored to such columns by metal anchors in every seven feet to the height of such column.

(m) A structural floor system shall ex-tend from one wall to an exposite wall and

tend from one wall to an opposite wall, and the difference wall to an opposite wall, and the walls shall be anchored to floor joists or girders or both with iron anchors placed opposite one another, secured to the same joists or girders in pairs, every seven feet or less of length of said walls. Where said joists or girders are of such length that it is not practicable to make them of one piece,

then the several pieces shall be joined at each splice or joint by the tie plates or tie bars or other metal connections of the same strength as the anchors. Such anchors shall have not less than four-tenths of a square inch of metal in its smallest cross-sectional The spikes, bolts or screws, securing said anchors and tie plates, shall be of such number and size as to transmit the tensile strain which the anchor is capable of resisting into the joists or girders to which said anchors are connected. All pin anchors shall extend at least eight inches into the supporting masonry.

(n) The story height of buildings shall be the distance between structural floor systems or between such structural floor systems and structural roof systems and shall

be as follows:

Where 12-inch walls are used, the story height shall not exceed 18 feet. Where 16-inch walls are used, the story

Where 16-inch walls are used, the story height shall not exceed 24 feet.
Where 20-inch walls are used, the story height shall not exceed 30 feet.
(0) Where the story height is greater than thirty feet, the walls shall not be of less thickness than the following: The upper fifteen feet shall be not less than sixteen inches in thickness, and the walls shall be increased four inches in thickness at each interval of fifteen feet or fractional part thereof of height.
(p) Curtain walls in skeleton construction buildings may be of hollow clay tile of the same thickness as herein required for

the same thickness as herein required for

brick walls.

(q) The walls of buildings to be used for the purposes of Classes III and VI and not more than two stories in height may be of hollow clay tile or moulded hollow concrete blocks not thinner than the thickness herein required for brick walls, subject to the approval of the Commissioner of Build-

ings.

\*(r) Interior brick walls used to support fireproof
floor construction, where brick walls are not required by this chapter, may be built thinner than
the thickness required by the previsions of 'aragraph (a) of this section, provided the proportion
between the thickness of such walls and the free
height between floors does not exceed fifteen, and
further provided the wife transpead out exceed

further provided the unit stresses do not exceed the stresses allowed by this chapter, and provided, also, that no such wall shall be constructed of a thickness less than twelve inches. \*Amended July 15, 1912.

520. **Ledges — Joist Supports.)** (a) In buildings two stories or more in height wherever party walls or partition walls twelve inches or less in thickness are used for the support of wood joists in buildings of Classes I, II, IV, V, VII and VIII the joists shall be supported on ledges of brick formed by corbeling not less than four courses of brick and the upper course shall project four inches beyond the face of the wall, and the joists shall be protected from the bettern to the trace former feet the diagram. the bottom to the top of same for the distance of the projection of the corbel by solid brick work laid in mortar.

(b) Wherever iron or steel joist and gir-

der boxes having five complete sides of iron, nowhere less than 4-inch in thickness, are

nowhere less than \(\frac{1}{2}\)-inch in thickness, are used, corbels and ledges as herein specified may be omitted.

(c) In buildings of every class where wood furring is used on brick walls, the brick between joists shall be projected from the bottom of the joist to the top of the joist for the full thickness of the furring and in no ease shall such projection be less

and in no ease shall such projection be less than two inches.

521. Walls of Altered Buildings—Increasing Thickness of.) If the walls of a building are not of sufficient thickness to comply with the requirements of this Charten for with the requirements of this Chapter for an enlarged or modified building, then the thickness of the existing walls shall be increased by building alongside of them a new wall, which shall not, however, be less in any part thereof than twelve inches thick, and which shall be increased in thickness by four inches for at least every forty feet in the height of such wall. Such new wall shall be laid in Portland cement mortar and shall be applied to the old wall but bonds shall be anchored to the old wall, but bonding with brick or masonry will not be considered as complying with this Chapter; and if an increase in the height of the building is contemplated, the wall from the top of the old wall shall be built jointly upon the new and old walls. If solid masonry buttresses are introduced in connection with such thickening and strengthening of existsuch thickening and strengthening of existing walls, the intervening wall may be reduced to eight inches in thickness, provided such buttresses are sufficient in number and in area to make the resultant structure of equal strength with the solid wall already specified. Provided, however, that steel or iron columns or beams may be used instead of such new wall, such columns or beams to be bolted or bonded to the existing wall in a manner satisfactory to and approved by the Commissioner of Buildings.

522. Walls—Party.) The provisions of the preceding section shall also apply to all cases where existing party walls are to be joined to for the erection of new buildings. But in the case of party walls, which ings. But in the case of party waits, which at the time of their erection were built in accordance with the terms of the city ordinances then in force, such walls, if sound and in good condition, may be used without increase of thickness for any building not higher than and of the same class as the building for which the original wall was built.

Walls-Erection of-Walls and Skeleton Framework Securely Braced.) In the erection of buildings of masonry construction, no wall shall be carried up at any time more than two stories above another wall of the same building. The walls and skeleof the same building. The walls and skele-ton framework of all buildings shall be kept securely braced and otherwise protected against the effects of the weather during all building operations.

524. Parapet Walls—When Required on Walls and Porches—Thickness and Height of.) (a) On all flat roof buildings parapet walls shall be crected, except as hereinafter provided, on all exterior walls and on all partition walls required by this ordinance by reason of the area of such buildings; provided, that such parapet walls may be dispensed with on any wall of a fireproof building, and on street and alley walls and on yard and court walls of buildings of other types where the entire framing and materials of the roof are strictly fireproof or where all portions of the roof nearer than fifteen feet to the lot line of such street or alley or bounding such yard or court are protected against fire by a continuous covering of porus or hollow tiles, not less than two inches thick and surfaced with mortar, on top of the roof boards. walls shall be erected, except as hereinafter with mortar, on top of the roof boards.

(b) Such parapet walls may be eight inches thick wherever this ordinance permits the use of eight-inch walls; elsewhere they shall be not less than twelve inches in

thickness.

(c) Such parapet walls shall extend at any point not less than three feet vertically above the roof on all such required partition walls and on all other walls within

partition walls and on all other walls within less than three feet of any division lot line and approximately parallel therewith; elsewhere they shall extend not less than eighteen inches above the roof.

(d) On all buildings whose roofs have a greater pitch than three inches per horizontal foot, parapet walls, of thickness and height as above specified, shall be erected on required partition walls on extended. on required partition walls, on exterior

walls approximately parallel with and less than three feet distant from a division lot and on walls abutting on another building. Provided, that such parapet walls may be dispensed with where the entire framing and materials of the roof are fireproof or where the cornice and roof covering are of incombustible material and the top of the roof boards is protected against fire for at least five feet up from such wall by a coating of plaster on porus or hollow tiles at least two inches thick; and further provided that such parapet walls and such protection against are may be dispensed with on buildings of Classes III and VI, three stories or less in height when such buildings have cornices of incombustible material and roof coverings of slate or terra cotta roofing tile.

525. Allowable Stresses and Special Requirements for Foundations—Bearing on Various Soils.) (a) If the soil is a layer of pure clay at least fifteen feet thick, wunout admixture of any foreign substance other than gravel, it shall not be loaded to exceed 3,500 pounds per square foot. If the soil is a layer of pure clay at least fif-teen feet thick and is dry and thoroughly compressed, it may be loaded not to exceed

4,500 pounds per square foot.
(b) If the soil is a layer of firm sand fifteen feet or more in thickness, and without admixture of clay, loam or other foreign it shall not be loaded to exceed

5,000 pounds per square foot.

(c) If the soil is a mixture of clay and sand, it shall not be loaded to exceed 3,000 pounds per square foot.

526. Foundations in Wet Soil—Trenches to Be Drained.) In all cases where foundations are built in wet soil, it shall be unlawful to build the same unless trenches in which the work is being executed are kept free from water by bailing, pumping, or otherwise, until after the completion of work upon the foundations and until all cement has properly set. In all cases a connection with the street sewer shall be established before beginning the work of laying foun-

#527. Foundations—Where not Permitted Depth Below Surface—Independent of Underground Construction Owned or Controlled by the City.) (a) Foundations shall not be laid on filled or made ground or on loam, or on any soil containing admixture of organic matter, and must rest on hard, sound soil. Foundations shall in all cases extend at least four feet below the finished surface of the ground upon which they are built, unless footings rest on bed

Foundations shall in all cases extend at least four feet below the surface of the which they are built, and in ground upon the case of all buildings 100 feet or more in height, foundations shall extend at least to the depth drained by the street sewer in the adjacent streets or alleys; but if such sewers are at a greater depth than ten feet below the sidewalk grade, such foundations need not extend to a greater depth than ten provided that sound, hard soil is found at that depth.

Every building forty feet or more in height, hereafter erected, which is located adjacent to any street or alley containing any then existing water main, water tunnel, sewer, conduit, tunnel, subway or other underground construction, owned or con-trolled by the City, shall be so constructed that the foundation or superstructure thereof shall not be supported in whole or in part by any such underground construction.

\*Amended December 19, 1910.

528. Foundation Construction.) Founda-52N. Foundation Construction.) roundations shall be constructed of stone, gravel or slag concrete, dimension stone or rubble stone, sewer or paving bricks, iron or steel

imbedded in concrete or piles, or a combination of any of the same. All masonry foundations shall be laid in cement mortar.

529. Foundation of New and Old Walls.)
In all cases where there is an increase in

the thickness of walls, a new foundation shall be built in such a manner as to carry jointly both the new and old walls, and the soil under such foundations shall not be loaded beyond the limits specified in this Chapter.

All foundations shall be protected against the effects of frost, and cement mortar which has been affected by frost, shall not be used

in building operations.

530. Foundations—File Borings Required—Safe Load Required—Fiber Stress.) (a)
Where pile foundations are used, the Commissioner of Buildings may require auger borings of the soil to be made to determine the position of the underlying stratum of hard clay or rock. The heads of the piles shall be protected against splitting while they are being driven. The piles shall be sawed off to a uniform level at least one foot below Chicago datum after being driven. and the heads shall be imbedded in concrete or covered with a grillage so proportioned that in the transmission of the load from the structure to the pile the stresses in the materials shall not exceed that prescribed in this Chapter. The top of timber grillage shall be at least one foot below Chicago

datum.

(b) The center of gravity of a pile foundation shall coincide with the center of gravity line of the load or loads which it

carries.

No pile of less than six inches diam-(e)

eter at small end shall be used.
(d) The safe load on a pile shall be determined by and shall not exceed the following formula:

$$P = \frac{\frac{2 \text{ wh}}{1}}{\text{S+}\frac{1}{10}} \text{ for steam hammer;}$$

$$P = \frac{\frac{2 \text{ wh}}{10}}{\text{S+}1} \text{ for drop hammer;}$$
In which formula

S=set in inches, h=fall in feet. w=weight of hammer. P=safe load in pounds.

(e) The maximum load on a timber pile shall not exceed 50,000 pounds.

A wood follower shall not be used in

determining the safe load. (g) Plans for pile foundations shall be submitted to the Commissioner of Buildings for approval and shall specify the least diameter of small end of piles, and no piles with smaller diameter of points than that specified for the job shall be used.

(h) There shall not be less than two rows of piles under all external party walls or other walls less than seventy feet high, and not less than three rows under all walls over seventy feet high, excepting under walls not exceeding fifty feet in height a single staggered row of piles may be used if other conditions of stability are complied

531. Concrete Piles Allowable-Compression—Tests—How Made. (a) Where concrete piles are used test piles shall be driven and loaded under the general direction of the Commissioner of Buildings.

(b) The allowable compression of concrete piles shall not exceed 400 pounds per square inch at a section six feet from the surface of the ground in immediate contact

with the pile.

(c) These tests shall conform to the following regulations: Tests shall be made on at least two piles in different locations and as

directed by the Commissioner of Buildings. Not less than three piles to be driven for each test. The pile to be loaded to be driven first, the second pile to be driven within six hours of the driving of the first, the third pile to be driven within twenty to twenty-four hours after the first. The two shall each be driven with centers not exceed twice the greatest diameter of pile, from the center of the test pile.

(d) The tests shall not be started until at least ten days after the piles to be loaded are driven, except that piles that have been cast and set up before driving may be tested as soon as practicable after driving. The piles shall be loaded with twi-proposed carrying load of the piles. twice the

(e) The settlement shall be measured daily until twenty-four hours shows no

settlement.

- (f) One-half of the test load shall be allowed for the carrying load, if the test shows no settlement for twenty-four hours and the total settlement has not exceeded one-hundredths of an inch multiplied by the test load in tons.
- 532. Steel Rails or Beams in Concrete.) If steel or iron rails or beams are used as parts of foundations, they shall be entirely imbedded in concrete extending then four inches beyond the metal. not less

533. Allowable Stresses and Special Requirements for Masonry.) (a) Allowable stresses in pounds per square inch on plain concrete and stone masonry shall not exceed the following:

	os.
	0.0
	0.0
Coursed rubble lime mortar 1	20
	60
First-class granite masonry, Portland	
	00
First-class lime and sandstone masonry,	
	0.0
Portland cement concrete 1-2-4 mixture,	
machine mixed 4 Portland cement concrete 1-2-4 mixture,	00
Portiand cement concrete 1-2-4 mixture,	50
hand mixed	9 U
ture, machine mixed	50
Portland cement concrete 1-216-5 mix-	30
ture hand mixed	0.0
ture, hand mixed	00
machine mixed	0.0
machine mixed	00
hand mixed 2	50
	50
	er
	X-
ceed the following:	Α-
	bs.
No. 1 paving brick, 1 part Portland ce-	
	50
No. 2 pressed brick and sewer brick.	
	50
No. 3 hard common select brick, Portland	00
cement mortar, same as referred to	
	0.0
	00
No. 4 hard common select brick, 1 part	
Portland, 1 lime, 3 sand as referred	
	75
No. 5 common brick, all grades, Portland	
	75
No. 6 common brick, all grades, good lime	
and cement mortar 1	25

(c) Brick under Nos. 1 and 2 shall not crush at less than 5.000 pounds pressure per square inch of gross area.

lime mortar ...... 100

No. 7 common brick, all grades, natural

cement mortar

No. 8 common brick, all grades, good

(d) Brick under Nos. 3 and 4 shall not crush at less than 2.300 pounds pressure per square inch of gross area.

(e) Brick under Nos. 5, 6, 7 and 8 shall not crush at less than 1,800 pounds pressure square inch of gross area. Sand lime brick, of this crushing strength may be used where common brick is permitted.

(f) Isolated piers of concrete, brick, or masonry shall not be higher than six times their smallest dimensions unless the above unit of stresses are reduced according to the following formula:

P equals C (1.25 minus-

In which formula

P is the reduced allowed unit stress.

C is the unit stress in the above table.

H is the height of the pier in feet.

D is the least dimension of the pier in feet. (g) No pier shall exceed in height twelve times the least dimension. Weight of pier shall be added to other loads in computing load coming on the pier.

534. **Definitions of Masonry.)** All masonry construction shall be defined as and comply with the following:

(a) Ordinary Rubble shall be defined as masonry composed of unsquared stones laid without attempting any regularity courses or bond;

(b) Coursed Rubble shall be defined as masonry having approximately level joints; stones to be roughly shaped so as to fit approximately; joints in wall or pier to be leveled off every three (3) feet in height and to be well bonded.

(c) First Class Masonry shall be defined as masonry built of stones in regular courses, the bearing surfaces of which as well as ends, to be roughly tooled off and shall be laid with alternate headers and stretchers so as to secure perfect bond.

535. Ashlar Facing.) (a) Ashlar facing of masonry walls shall only be considered as part of wall for the purpose of carrying weight, when it has a minimum bond as as part of follows:

(b) Every second course to be a bond course, this bond course to extend into the backing a distance equal to the least thickness of ashlar. In addition to such bond, each stone in all courses shall be tied to backing by two galvanized iron anchors. No ashlar shall be less than four inches thick, nor shall the height of any stones exceed five times its thickness.

Soft Bricks-Where Not Permitted.) Soft bricks shall not be used in any part of a building where exposed to the weather. in external or internal piers of bearing nor walls.

Brickwork-Bond of.) The bond of all brickwork shall be formed by laying one course of headers for every five courses of stretchers: provided that in the case of pressed brick facing, two headers and a stretcher may be laid alternately in every sixth course or an equivalent number of full headers may be used in any other arangement approved by the Commissioner of Buildings: and provided further, that pressed brick facing, when not counted as part of the bearing wall, may be laid with fewer or no header courses if anchored to the backing by metal ties of design, material, weight and quantity approved by the Commissioner of Buildings.

538. Bricks—How Laid.) All brick laid up in cement, or lime and cement mortar. shall be thoroughly drenched immediately before being laid unless laid in freezing weather. Both horizontal and vertical joints shall be filled with mortar in all kinds of brick masonry.

539. Allowable Stresses and Special Requirements for Timber.) The maximum allowable stresses in pounds per square inch on actual sections for timber shall be as follows:

(e) For steel columns filled with, but not encased in, concrete the steel shall be calculated to carry the entire live and dead load. In this case the above formulæ may

	Extreme Fibre Stress and Tension with Grain.	Compression with Grain.		n Shear with Grain,
Douglas Fir and Long Leaf Yellow Pine. Oak Short Leaf Yellow Pine. Norway Pine White Pine Hemlock	$ \begin{array}{cccc} & 1,200 \\ & 1,000 \\ & 800 \\ & 800 \end{array} $	$\begin{array}{c} 1,100 \\ 900 \\ 800 \\ 700 \\ 700 \\ 500 \end{array}$	$\begin{array}{c} 250 \\ 500 \\ 250 \\ 200 \\ 200 \\ 150 \end{array}$	$\begin{array}{c} 130 \\ 200 \\ 120 \\ 80 \\ 80 \\ 60 \end{array}$
The unit stress on timber nosts shall com-	be used by	ut the allowa	hle stress s	shall not

The unit suess on ply with the formulæ:

$$C (1 - \frac{L}{80D})$$

In which formula:

C equals compressive strength of timber with the grain as given in table.
L equals length in inches.
D equals least diameter inches.

The maximum length of a timber post shall not exceed thirty diameters.

Timber columns shall not be used in buildings of greater height than twice the width of the building nor in buildings over one hundred feet in height.

- 540. Quality of Timber.) Timber used for building purposes shall be sound, well manufactured, close grained, free from wind shakes, or from dead, loose, decayed, encased or pitch knots, or knots and other defects that will materially impair its strength and durability.
- 541. Maximum Allowable Stresses and Special Requirements for Metals.) (a) maximum allowable stresses in pounds per square inch in steel and iron shall not exceed the following:

be used, but the anowable stress shall not exceed 14,000 pounds.

(f) Stress due to eccentric loading shall

(f) Stress due to eccentric loading shall be provided for in all compressive members.

(g) The length of rolled steel compressive members shall not exceed one hundred twenty times the least radius of gyration, but the limiting length of struts for wind bracing only may be one hundred fifty times the least radius of gyration. The limiting length for cast iron columns shall be seventy times the least radius of gyration.

times the least radius of gyration.

(b) Cast iron columns shall not be used in buildings of greater height than twice the least width, or in buildings over 100

feet high.

542. Live and Dead Loads—Stress.) (a) Wherever the live and dead load stresses are of opposite character, only 70 per cent of the dead load stress shall be considered as effective in counteracting the live load stress.

(b) For stresses produced by wind forces combined with those from live and dead load, the unit stress may be increased fifty per cent. over those given above; but the section shall not be less than required if wind forces be neglected.

	Rolled Steel.	Cast Steel.	Wrought Iron.	Cast 1ron.
Tension on net section	14,000	16,000 $14,000$	12,000 10,000	10,000
Bending on extreme fibre tension.  Bending on extreme fibre compression.		16,000	12,000	3.000
Dending on extreme fibres of pins.  Shear: shop driven rivets and pins.  Shear: field driven rivets.	$\frac{25,000}{12,000}$			
Shear on rolled steel shapes	$\frac{12,000}{10,000}$			
Shear on brackets  Bearing, shop driven rivets and pins.  Bearing, field rivets	25,000			2,000
200000000000000000000000000000000000000	20,000			

(b) The allowable compressive stresses per square inch shall be determined by the following formulæ:

Steel16,000—70 L/R
Wrought iron12,000— $60\frac{L}{R}$
Cast iron

In the above formulæ:

L equals length in inches.

R equals least radius of gyration in inches.
(c) In no case shall the allowable com-

pressive stress exceed that given in paragraph (a) of this section.
(d) For steel columns filled with, and (d) For steel columns filled with, and eneased in concrete extending at least three inches beyond the outer edge of the steel, where the steel is calculated to carry the entire live and dead load, the allowable stress per square inch shall be determined by the following formulæ:

but shall not exceed 16,000 pounds.

543. **Riveting—Tension.)** (a) In proportioning tension members the diameter of the rivet holes shall be taken one-eighth of an inch larger than the nominal diameter of the rivet

(b) In proportioning rivets the nominal

diameter of the rivet shall be used.
(c) Pin-connected riveted tension bers shall have a net section through the pin-hole at least 25 per cent in excess of the net section of the body of the member and the net section back of the pin-hole, parallel with the axis of the member, shall not be less than the net section of the body. not be less than the net section of the body of the member.

544. Plate Girders — Flanges — Compression.) (a) Plate girders shall be proportioned either by the moment of inertia of their net section, or by assuming that the flanges are concentrated at their centers of gravity and a unit stress used such that the extreme fibre stress does not exceed 16,000 pounds per square inch, in which case one-eighth of the gross section of the web, if properly spliced, may be used as flange

section.
(b) The gross section of the compression flanges of plate girders shall not be

less than the gross section of the tension flanges; nor shall the stress per square inch in the compression flange of any beam or girder of a longer length than 25 times the width exceed.

20,000-160-

In which formula L equals unsupported distance and

B equals width of flange.

- (c) The flanges of plate girders shall be connected to the web with a sufficient num-ber of rivets to transfer the total shear at any point in a distance equal to the effective depth of the girder at that point combined with any load that is applied directly on the flanges.
- Webs of plate girders shall be provided with stiffeners over all bearing points, under all points of concentrated loading and elsewhere when required by good engineering practice.

# Reinforced Concrete.

- Reinforced Concrete.

  545. Reinforced Concrete Definition —
  Plans.) The term "Reinforced Concrete"
  means any combination of metal imbedded
  in concrete to form a structure so that the
  two materials assist each other to sustain
  all the stresses imposed. Before a permit
  to erect any reinforced concrete structure
  is issued, complete plans and specifications
  shall be filed with the Commissioner of
  Buildings, showing all details of the construction, including detail of working joints,
  the size and position of all reinforced rods. the size and position of all reinforced rods, stirrups or other forms of metal, and giving the composition and proportion of the concrete; provided, however, that permission to erect any reinforced concrete structure does not in any manner approve the con-struction until after tests have been made of the actual construction to the satisfac-tion of the Commissioner of Buildings.
- 546. Ratio of Moduli of Elasticity—Adhesion—Bond.) (a) The calculations for the strength of reinforced concrete shall be based on the assumed ultimate compressive strength per square inch designated by the letter "U" given in the table below for the mixture to be used.

(b) The ratio designated by the letter "R" of the modulus of elasticity of steel to that of the different grades of concrete shall The ratio designated by the letter be taken in accordance with the following

10 12 15 19 2.0

547. Unit Stresses for Steel and Concrete.) (a) The stresses in the concrete and the steel shall not exceed the following limits:

(b) Tensile stress in steel shall not exceed one-third of its elastic limits and shall not exceed 18,000 pounds per square inch.

Shearing stress in steel shall not ex-

(c) Shearing stress in second ceed 12,000 pounds per square inch. (d) The compressive stress in steel shall not exceed the product of the compressive stress in the concrete multiplied by the elastic modulus of the steel and divided by the elastic modulus of the concrete.

(e) Direct compression in concrete shall be one-fifth of its ultimate strength. Bend-ing in extreme fibre of concrete shall be thirty-five one-hundredths of the ultimate

strength.

Tension in concrete on diagonal plane (f) shall be one-fiftieth of the ultimate compressive strength.

(g) For a concrete composed of one part of cement, two parts of sand and four parts of broken stone, the allowable unit stress for adhesion per square inch of surface of imbedment shall not exceed the following: Pounds Per

Sq. Inch.

On plain round or square bars of struc-

tural steel ...... On plain round or square bars of high 5.0

the sides is not more than 2 to 1.... On twisted bars when the twisting is not less than one complete twist in eight

such bars without appreciable slip which shall be determined by tests made by the person, firm or corporation to the satisfaction of the Commissioner of Buildings, but provided that in no case shall such allowable unit stress exceed 100 pounds per square inch of the specially formed bars.

548. Design for Slabs, Beams and Gird-Reinforced concrete slabs, beams girders shall be designed in accordance with the following assumptions and re-

quirements:

(a) The common theory of flexure shall be applied to beams and members resisting bending.

(b) The adhesion between the concrete and the steel shall be sufficient to make the two materials act together.

(c) The steel to take all the direct tensile stresses.

(d) The stress strain curve of concrete in compression is a straight line.

(e) The ratio of the moduli of elasticity of concrete to steel shall be as specified in the table in Section 546.

Moments of External Forces.) (a) Beams, girders, floor or roof slabs and joists shall be calculated as supported, or with standard or with standar fixed ends, or with partly fixed ends, in ac-cordance with the actual end conditions, the number of spans and the design.

(b) When calculated for ends partly fixed for intermediate spans with an equally

distributed load where the adjacent spans are of approximately equal lengths:

Bending moment at center of spans shall not be less than that expressed in the for-

 $M.\Gamma_5$  $M\Gamma_3$ mula --- for intermediate spans and 12

for end spans. (c) The moment over supports shall net  $WL^2$ 

be less than the formula  $\frac{\dots}{13}$ - and the sum

of the moments over one support and at the center of span shall be taken not less than WL2

the formula -

In the formula hereinabove given "W" is the load per lineal foot and "L" the length of span in feet.

(d) In case of concentrated or special loads the calculations shall be based on the critical condition of loading.

(e) For fully supported slabs, the free opening plus the depth, for continuous slabs, the distance between centers of supports, is

the distance between contact to be taken as the span.

(f) Where the vertical shear, measured on the section of a beam or girder between the section of action of the horizontal shear the ultimate the centers of action of the horizontal stresses, exceeds one-fifth of the ultimate direct compressive stress per square inch, web reinforcement shall be supplied sufficient to carry the excess. The web reinforcement shall extend from top to bottom of beam, and loop or connect to the horizontal reinforcement. The horizontal rein-forcement carrying the direct stresses shall not be considered as web reinforcement.

(g) In no case, however, shall the vertical shear, measured as stated above, exceed one-fifteenth of the ultimate compression

strength of the concrete.

(h) For T beams the width of the stem only shall be used in calculating the above

(i) When steel is used in the compression side of beams and girders, the rods shall be tied in accordance with requirements of vertical reinforced columns with stirrups connecting with the tension rods

of the beams or girders.

(j) All reinforcing steel shall be accurately located in the forms and secured against displacement; and inspected by the representative of the architect or engineer in charge before any surrounding concrete be place. It shall be afterwards cominclosed by the concrete, and such put in place. It steel shall nowhere be nearer the surface of the concrete than 1½-inch for columns. 11/2-inch for beams and girders, and 1/2-inch. but not less than the diameter of the bar, for slabs.

(k) The longitudinal steel in beams and girders shall be so disposed that there shall be a thickness of concrete between the separate pieces of steel of not less than one and one-half times the maximum sectional dimension of the steel.

(1) For square slabs with two-way reinforcements the bending moment at the center of the slab shall not be less than that  ${\rm WL}^2$ 

 for interexpressed in the formula -24

 $M_*\Gamma_5$ mediate spans, and - for end spans. 2.0

(m) The moment over supports shall not  $M_1\Gamma_5$ - and the sum be less than the formula -36

of the moments over one support and at the center of the span shall be taken not less  $\overline{\mathrm{WL}^2}$ 

than the formula -19

In which above formula "W" is the load per lineal foot and "L" the length of the

squares or rectangular (n) the distribution of the loads in the two directions, shall be inversely as the cubes of the two dimensions.

- (o) Exposed metal of any kind will not be considered a factor in the strength of any part of any concrete structure, and the part of any concrete structure, and the plaster finish applied over the metal shall not be deemed sufficient protection unless applied of sufficient thickness and so se-cured as to meet the approval of the Com-missioner of Buildings.
- 550. Limiting Width of Flange in "T" Beams.) (a) In the calculation of ribs. a portion of the floor slab may be assumed as acting in flexure in combination with the rib. The width of the slab so acting in flexure is to be governed by the shearing resistance between rib and slab, but limited to a width equal to one-third of the span length of the ribs between supports and also limited to a width of three-quarters of the distance from center to center between

No part of the slab shall be considered as a portion of the rib. unless the slab and rib are cast at the same time.

(c) Where reinforced concrete support reinforced concrete beams, the por-tion of floor slab acting as flange to the girder must be reinforced with rods near the top, at right angles to the girder, to enable it to transmit local loads directly to the girder and not through the beams.

- 551. Shrinkage and Thermal Stresses.) Shrinkage and thermal stresses shall be provided for by introduction of steel.
- 552. Reinforced Concrete Columns—Limit of Length—Per Cent of Reinforcement—Bending Moment in Columns—Tying Vertical Rods.) (a) Reinforced concrete may be used for columns in which the concrete shall not be leaner than a:1:2:4 mixture and in which the ratio of length to least side or diameter does not exceed twelve, but in no case shall the cross section of the column be less than 64 square inches. Longitudinal reinforcing rods must be tied together to effectively resist outward flexure at in-tervals of not more than twelve times least diameter of rod and not more than inches. When compression rods are not required, reinforcing rods shall be used, equivalent to not less than one-half of one per cent (.005) of the cross sectional area of the column; provided, however, that the total sectional area of the reinforcing steel shall not be less than one square inch, and that no rod or bar be of smaller diameter or least dimensions than one-half inch. The area of reinforcing compression rods shall be limited to three per cent. of cross sec-tional area of the column. Vertical rein-forcing rods shall extend upward or down-ward into the column, above or below, lapping the reinforcement above or below enough to develop the stress in rod by the allowable unit for adhesion. When beams or girders are made monolithic with or rigidly attached to reinforced concrete col-umns, the latter shall be designed to resist a bending moment equal to the greatest possible unbalanced moment in the beams or girders at the columns, in addition to the direct loads for which the columns are designed.
- (b) When the reinforcement consists of vertical bars and spiral hooping, the concrete may be stressed to one-fourth of its ultimate strength as given in Section 546, provided, that the amount of vertical reinforcement be not less than the amount of the spiral reinforcement, nor greater than eight per cent, of the area within the hooping; that the percentage of spiral hooping be not less than one-half of one per cent. be not less than one-half of one per cent, nor greater than one and one-half per cent; that the pitch of the spiral hooping be uniform and not greater than one-tenth of the diameter of the column, nor greater than three inches; that the spiral be secured to the verticals at every intersection in such a manner as to insure the maintaining of its form and position, that the verticals he spaced so that their distance apart, measured on the circumference be not greater than nine inches nor one-eighth the circumthan nine inches, nor one-eighth the circumference of the column within the hooping. In such columns, the action of the hooping may be assumed to increase the resistance the concrete equivalent to two and onehalf times the amount of the spiral hooping figured as vertical reinforcement. No part of the concrete outside of the hooping shall be considered as a part of the effective column section.
- 553. Structural Steel Columns.) the vertical reinforcement consists of a structural steel column of box shape, with lattice or battenplates of such a form as to permit its being filled with concrete, the concrete may be stressed to one-fourth of its ultimate strength as given in table in Section 546, provided that no shape of less than one square inch section be used and that the spacing of the lacing or battens be not greater than the least width of the columns.

- Curtain Walls in Skeleton Construc-554. tion Buildings.) Buildings having a complete skeleton construction of steel or of reinforced concrete construction, or a combination of both, may have exterior walls of reinforced concrete eight inches thick; provided, however, that such walls shall sup-port only their own weight and that such walls shall have steel reinforcement of not less than three-tenths of one per cent in each direction, vertically and horizontally, the rods spaced not more than twelve-inch centers and wired to each other at each intersec-All bars shall be lapped for a length tion. All bars shall be lapped for a length sufficient to develop their full stress for the allowable unit stress for adhesion. Additional bars shall be set around openings, the verticals wired to the nearest horizontal bars, and the horizontal bars at top and bottom of openings shall be wired to the nearest vertical bars. The steel rods shall be combined with the concrete and placed where the combination will develop the greatest strength, and the rods shall be staggered or placed and secured so as to resist a pressure of thirty pounds per square foot, either from the exterior or from the interior on each and every square foot of each wall panel.
- 555. Bending and Elongation of Steel.) The bending and elongation of steel used in reinforced concrete construction shall conform to the following requirements: (a) Steel having a diameter of three-fourths of an inch or less shall be capable of bending cold ninety degrees over a diameter equal to twice the thickness of the piece without fracture; steel over three-fourths inch in diameter shall be capable of bending cold to ninety degrees over a diameter equal to three times the diameter of the piece.
- (b) The material of reinforcement shall be such form that it will not elongate under working stress to exceed one fifteen-hundredth.
- (c) Reinforcing steel used in reinforcing concrete construction shall not be painted, but shall be free from all mill scale and loose rust.
- 556. Cement Tests.) (a) Only Portland cement shall be used in reinforced concrete construction. All cement shall be tested in car load lots when delivered, or in quantities equal to the same. Coment failing to meet the requirements of accelerated test shall be rejected.
- (b) Pats of neat cement must be allowed to harden twenty-four hours in moist air, and then be submitted to the accelerated test as follows: A pat is exposed in any convenient way in an atmosphere of steam, and above boiling water, in a loosely closed vessel for three hours, after which before the pat cools, it is placed in the boiling water for five additional hours. To pass this test satisfactorily, the pat shall remain firm and hard, and show no signs of cracking, distortion or disintegration.
- (c) Portland cement when tested shall have a minimum tensile strength as follows: Neat cement after one day in moist air shall develop a tensile strength of at least 200 pounds per square inch; after one day in air and six days in water shall develop a tensile strength of at least 500 pounds per square inch, and after one day in air and twenty-seven days in water, shall develop a tensile strength of at least 600 pounds per square inch. Cement and sand tests composed of one part of cement and three parts of sand shall after one day in air and six days in water, develop a tensile strength of at least 175 pounds per square inch; and after one day in air and twenty-seven days in water, shall develop a tensile strength of at least 175 pounds per square inch; and after one day in air and twenty-seven days in water, shall develop a tensile strength of at least 240 pounds per square inch.

- (d) A certificate that the cement used has been tested and has met the requirements of this section and that the tests have been made in accordance with the standard methods prescribed by the American Society for Testing Materials, on pages 149 to 164, both inclusive, of the proceedings of the Eleventh Annual Meeting of the American Society for Testing Materials, adopted August 15, 1908, shall be furnished by the architect or engineer in charge to the Commissioner of Buildings.
- 557. **Sand.)** The sand to be used for concrete shall be clean, hard, coarse sand, of the grade known as torpedo sand, and free from loam or dirt, not less than 45 per centum shall be returned on a screen of 400 mesh to the square inch.
- 558. **Stone.)** The stone to be used in concrete shall be clean crushed hard stone or clean crushed blast furnace slag or gravel of a size to pass through a one-inch square mesh. If limestone or slag is used, it shall be screened to remove all dust; if gravel is used, it shall be thoroughly washed. Stone shall be drenched immediately before using. If slag is used, it shall be of such cuaracter that when made into concrete the concrete will develop a crushing strength equal to that specified for stone or gravel concrete.
- 559. Mixing.) All concrete shall be mixed in a mechanical mixer except when limited quantities are required, or when the conditions of the work make hand mixing preferable; hand mixing to be done only when approved by the Commissioner of Buildings. In all mixing, the separate ingredients shall be measured and shall be thoroughly mixed and must be uniform in color, appearance and consistency before placing.
- 560. Placing Concrete.) In filling in concrete around reinforcing steel, the concrete must be worked continuously with suitable tools, as it is put in place. Filling the forms completely and puddling afterward will not be permitted. In placing the concrete, the work shall be so laid out that partly set concrete will not be subjected to shocks from men wheeling or handling material over it.
- 561. Concrete Flaced in Freezing Weather.) When concreting is carried on in freezing weather, the material must be heated, and such provisions made that the concrete can be put in place without freezing. The use of frozen, lumpy sand, or stone depending on hot water used in mixing to thaw it cut will not be permitted. All reintorced concrete shall be kept at a temperature above freezing for at least forty-eight hours after being put in place. All forms under concrete placed in freezing weather shall remain until all evidences of frost are absent from the concrete and the natural hardening of the concrete has proceeded to the point of safety.
- 562. Concrete Placed in Warm Weather.) Concrete laid in warm weather shall be drenched with water twice daily, Sunday included, during the first week after being put in place.
- 563. Cement Finish.) Cement finish added to the top of slabs, beams, or girders, shall not be calculated in the strength of a member unless laid integrally with the rough concrete. No greater unit stress shall be allowed on such cement finish than on the rough concrete.
- 544. Fireproof Concrete Construction.) Reinforced concrete construction will be accepted for fireproof buildings if designed as prescribed in this paragraph. The aggregate for such concrete shall be clean, broken stone or clean crushed blast furnace slag, or clean screened gravel, together with clean, coarse sand of the grade known as torpedo

sand; stone, slag or gravel shall be of a size to pass through a screen of three-quarter inch mesh. The minimum thickness of concrete surrounding the reinforcing members of reinforced concrete beams and girders shall be two inches on the botton, and one and one-half inches on the sides of said beams and girders. The minimum thickness of concrete under slab rods shall be one inch; and all reinforcement in columns shall have a minimum protection of two inches of concrete except as hereinafter provided, if a supplementary metal fabric is placed in the concrete surrounding the reinforcing, simply for holding the concrete, the thickness of concrete under the reinforcing may be reduced by one-half inch, then such fabric shall not be considered as reinforcing metal.

565. Removal of Forms.) In no case shall the props and shores used in reinforced concrete construction be removed from under floors and roofs in less than two weeks, except as is provided herein. Column forms shall not be removed in less than four days. The centering from bottom of slabs and sides of beams and girders may be removed after the concrete has set for one week, if the floor has obtained sufficient hardness to sustain the dead weight of the said floor. No load or weight shall be placed on any portion of the construction until the concrete has fully set and the centers have been removed.

The contractor for the re-Tests.) ed concrete construction shall make tests on any portion of the work inforced concrete construction within a reasonable time after erection, as may be required by the Commissioner of Buildings. Such tests must be made under the direction of the Commissioner of Buildings in his presence or in the presence of his representative, and must show that the construction will sustain a load twice the sum of the live and dead loads for which it was designed, without any sign of failure. The construction may be considered as part Each test load shall cover of the test load. two or more panels and shall remain in place at least twenty-four hours. The deflection under the full test load at the expiration of twenty-four hours shall not exceed one eight-hundredth of the span. These tests shall be considered as tests of workmanship only.

567. Reinforced Terra Cotta Hollow Tile.)
(a) The term reinforced hollow tile is hereby defined to mean a system of hollow burned clay tile in combination with reinforced concrete, in which combination the hollow tile may be used to resist compressive and shearing stresses subject to the following provisions:

The provisions relating to reinforced concrete construction shall hold as far as applic-

able to this system.

All tile to be hard burned terra cotta tile of uniform quality, free from shrinkage cracks, with true beds and having an ultimate compressive strength of not less than 4,000 pounds per square inch of net area of surface tested.

The following stresses and values shall not be exceeded: Extreme fibre stress (compressive) on hollow tile, 500 pounds per share inch.

Shearing stress on hollow tile, 200 pounds

per square inch.

Adhesion between tile and 1:2:4 concrete to 1:3 cement mortar, 40 pounds per square inch.

Ratio of modulus of elasticity of steel to that of tile with cement mortar joints, 10.

(b) Special Provisions as to Workmanship in Reinforced Hollow Tile Construction.) The hollow tile shall be thoroughly soaked with water at the time concrete is poured and be kept drenched for at least thirty-six hours afterwards. The joints between tiles shall be staggered, buttered and slushed full of mortar consisting of one (1) part of Portland cement and three (3) parts of clean, sharp sand, thoroughly mixed.

(c) Terra Cotta Tile Columns.) Columns of solid terra cotta or of hollow terra cotta in which the sectional area of the open holes in each block shall not exceed twenty (20) per cent of the gross sectional area of such block, may be used for structural purposes provided the height of such column shall not exceed twelve times the least dimension.

The allowable stress shall not exceed 350 pounds per square inch and shall be subject to the reduction formula given in Sec-

tion 553 in paragraph f.

All terra cotta tile used for construction of columns shall be hard burned terra cotta tile of uniform quality, free from shrinkage cracks, with true beds and having ultimate compressive strength of not less than 6,000 pounds per square inch of net area of cross section of samples tested.

Mortar used in setting terra cotta tile walls and columns to be composed of one (1) part Portland cement and three (3) parts clean, sharp sand, thoroughly mixed.

(d) Special Provisions as to Workmanship in Tile Column Construction.) All terra cotta tile must be thoroughly wet before using and when used in columns must be set on end with the voids running vertically and directly over each other, and with the webs in direct line of pressure.

All vertical joints must stagger and terra cotta blocks must be of proper dimensions to meet this condition as no broken tile will

be allowed.

All work to be set plumb, with uniform horizontal joints, thickness to average three-eighths (3-8) of an inch. The minimum time which shall elapse between the finishing of the work and before any load is placed thereon shall be not less than seven days

- (e) Terra Cotta Tile Walls.) Hollow tile may be used for building primary bearing walls, which are defined as walls that may be used to receive directly the loads from floors or roofs in addition to their acting as partition walls, provided the proportion between thickness of wall and free height between the floors does not exceed fifteen (15) and the load including the weight of the construction does not exceed three burnthe construction does not exceed three hundred and fifty (350) pounds per square inch of net sectional area of tile, and shall be of the thickness specified by this chapter for brick walls. Hollow terra cotta tile may be used for exterior walls, but when so used the thickness and height of the work must conform to the dimensions required brick walls in this chapter, but must in no case exceed four stories in height in any building. The thickness of walls shall be calculated as the outside dimensions of the tile and each tile shall be full thickness of wall. The thickness of the plastering is not to be included as a part of the thickness of the wall. Walls having a thickness of 4 inches may be used when the height does not exceed five (5) feet. The quality of the tile and mortar and special provisions as to workmanship as specified for terra cotta columns shall apply to terra cotta tile walls.
- (f) Terra Cotta Grain Bin Construction.) Fireproof storage bin, grain elevators and grain warehouses may be built in cylindrical form with terra cotta tile of such height, diameter and thickness as is allowed by safe engineering practices, provided that the material shall not be stressed in excess of the limits prescribed in this chapter for walls and columns.
- 568. Cinder Concrete.) (a) Cinder concrete construction may be used for all buildings in which fireproof construction is man-

datory by this chapter, or where ordinary construction, mill construction or slow-burning construction may be used.

- (b) Only clean, thoroughly burnt, steam boiler cinders, free from matter other than cinders may be used. The cinders used shall be of such size that they will pass through a one-inch square mesh. Cinder concrete piers or walls shall not be permitted to carry loads and shall not be given credit therefor.
- (c) The ultimate compressive strength per square inch of cinder concrete shall be taken as not exceeding seven hundred pounds. The ratio of the modulus of elasticity of steel divided by the modulus of elasticity of cinder concrete shall be taken as thirty.
- (d) There shall not be less than one part of Portland cement to seven parts of cinders and sand of the grade known as torpedo sand in cinder concrete. All other special requirements and methods of calculation for reinforced concrete as required in this chapter shall modify and regulate the use of cinder concrete in buildings.
- (e) All steel and all metal pipe and conduits enclosed in cinder concrete shall be protected by a coating of cement grout or plastered with good lime mortar before the cinder concrete is placed.
- (f) For fireproof construction, the minimum thickness of cinder concrete covering on structural metal shall be the same as required for brick or concrete covering for fireproof buildings by this chapter. In slow-burning or mill construction buildings, the minimum thickness of cinder concrete covering on structural metal shall be three inches on columns and two inches on beams, girders and other structural steel or iron members.
- (g) Wherever cinder concrete is used for the covering of columns, beams, girders or other structural steel members of a building the cinder concrete covering shall have metal binders, or wire fabric, imbedded in and around said columns, beams, girders or other structural steel members. If wire is used for said metal binders, it shall not be smaller than No. 8 gauge wire and shall be spaced not less than sixteen inches apart along the length of the steel member covered.
- (h) Where cinder concrete construction is used for a building which, by this chapter, is required to be of fireproof construction, all parts that carry weights or resist strains, shall be made entirely of incombustible material, and all metallic structural members shall be protected against the effects of fire by cinder concrete proportioned, mixed, applied and secured as herein described.
- (i) All other parts of a building of cincer concrete construction, built where fire-proof construction is mandatory by this chapter, shall be built and made of the material required by this chapter for buildings of fireproof construction; provided, however, that cinder concrete as described herein, and of the same thickness elsewhere specified, may be used for all protective covering of structural metal, after such metal has been protected by a coating of cement grout or plastered with good lime mortar, as required by this chapter.

# Skeleton Construction.

569. Skeleton Construction.) (a) The term "Skeleton Construction" shall apply to all buildings wherein all external and internal loads and stresses are transmitted from the top of the building to the foundations by a skeleton or framework of metal or reinforced concrete.

- (b) In metal frame skeleton construction the beams and girders shall be riveted to each other at their respective junction points. If columns made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders shall have riveted connections to unite them with the columns. If cast iron columns are used, each successive column shall be bolted to the one below it by at least four bolts not less than ¾ inch in diameter, and the beams and girders shall be botted to the columns. Bolt holes in flanges tor connection from column to column shall be drilled. At each line of floor or roof beams, lateral connections between the ends of the beams and girders shall be made in such manner as to rigidly connect the beams and girders with each other in the direction of their length.
- (c) All steel trusses shall be riveted and the steel work in buildings more than 100 feet high and in a building whose height exceeds twice its width shall be riveted.
- (d) Wherever it is found impossible to rivet connections as herein described and such connections are bolted, cold rolled or turned bolts of exact fit and diameter in reamed holes may be used in place of rivets with the same allowable stresses as field driven rivets.

(e) All structural members which are temporarily bolted together shall be well bolted in every alternate hole.

- (f) After the bases or base plates and columns have been set in place, both shall be protected by a covering of cement concrete applied direct to the metal, measuring not less than two and one-half inches thick from the extreme projection of the metal, filled solid into all spaces, and forming a continuous concrete mass from the grillage or other foundations to an elevation six feet above the floor level nearest the column base plate or column stool.
- (g) All metal shall be clean and shall be free from loose rust and scale, and all metal except that to be embedded in concrete shall be protected with at least two coats of metal protecting paint.
- (h) All structural details and workmanship shall be in accordance with accepted engineering practice.
- (i) All trusses shall be held rigidly in position, both temporarily and permanently by efficient lateral and sway bracing.

## Miscellaneous Provisions.

- 570. Porches—Verandas—Porticos—Construction of Inside Fire Limits.) (a) The enclosing walls of porches, verandas, or porticos shall be of incombustible material on buildings inside the fire limits, except that where such porches, verandas, or porticos constitute part of a storm house or of a storm door enclosure, they may be of combustible material, providing, that they be not more than twelve feet high, nor occupy a greater frontage than two feet more than the width of the inner doors protected by such storm enclosure.
- (b) On buildings more than three stories in height, porches hereafter erected, if of combustible material, shall not exceed one story in height. Where porches of incombustible material are continuous and extend fifty feet or more across the rear of buildings, there shall be a partition of incombustible material separating each fifty feet of porch from the adjacent porch.
- 571. Tanks on Roofs—Permits—Fees.) It shall be unlawful for any person, firm or corporation to construct, maintain or allow, or permit to remain in or upon the roof of any building in the city, any tank of a larger capacity than four hundred gallons, unless such tank shall rest upon a good and sufficient foundation of solid brick or stone

masonry, or upon iron girders set on steel plates which rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron or steel construction. No tank of a capacity exceeding four hundred gallons shall be constructed in or upon any building without first submitting for the approval of the Commissioner of Buildings a complete set of plans, showing the construction in detail of the supports and foundations of such tank. If such plans shall be satisfactory to the Commissioner of Buildings, they shall be approved by him. The owner or his agent or the contractor with the erection of such tank, procure from the Department of Buildings a permit for the sub-structure work, for which permit a fee of five dollars shall be charged.

- 572. Door and Window Openings, When Protected in Buildings of Classes I, II, IV, V, VII and VIII—fron Doors—Wired Glass Set in Metal Frames.) (a) Where the distance from door to window openings in buildings of Classes I, II, IV, V, VII and VIII is less than thirty (30) feet from the epposite side of the established alley line and where the windows and doors of two or more areas of the same building which is required to be separated by dividing walls by this chapter, are on a court, every such window and door, distant less than thirty feet from another window or door of another such area and where also the doors and window openings are within fifteen (15) feet of an inside lot line, such openings shall be provided with windows and doors constructed of wire glass set in metal frames and sash; provided, further, that doors may be automatic rolling steel shutters or steel plate doors or metal-clad wood doors, and further provided that at least one of the first or ground floor doors must be a swinging door.
- Where iron doors are used to fulfill the requirements of this section they shall be made of sheet iron or steel, of not less than No. 14 U. S. gauge metal, and shall lap the wall at least one-half inch all around the opening, and the bottom shall fit the sill closely where it is not practicable to lap it. The frames and crossbars shall be made of one and one-half by one and one-half by one-fourth inch angles and in no case shall there be less than two crossbars, and where the doors are over six feet high, such crossbars shall be spaced not more than two feet apart. Lever bars shall be made of one and one-half by three-eighths inch iron. extending at least one-third of the distance across the opposite leaf. The number and spacing of such lever bars shall be the same Where hinges are used as the crossbars. shall be made of two by one-fourth inch iron, extending at least three-fourths of the way across the door. The number and spacing of such hinges shall be the same as is required for the crossbars. Pin bolt or eyes shall be one-half inch round and shall be securely fastened to the building.
- (c) Where metal frames and wired glass are used to fulfill the requirements of this section, the glazed portion of the frames and sash shall be set with fire-resisting glass such as is elsewhere herein defined. The unsupported area of the glass shall be in neither width nor length greater than forty-eight inches or exceed seven hundred and twenty (720) square inches in any one pane of glass. The glass must be supported by frames and sashes. The wired glass shall be retained by the structural part of the frame or sash independently of material used for waterproof purposes and only non-inflammable material shall be used in setting glass in the sash. Frames shall be of such form as to be retained by the walls either with flanges of at least one inch in

- width or by hooks of proper length securely driven into the wall or by means of extending wings flush with the brickwork and securely spiked to the wall. Frames shall be made of galvanized iron of not less than No. 24 gauge metal, and of a quality soft enough to permit all necessary bending without breaking, or they may also be constructed of not less than 20-ounce copper, or other metal of equal strength and durability and which will not melt at a lower temperature than copper. All joints shall be made with interlocking seams. They shall be securely riveted together, and in no case, shall solder be used. Grooves and rabbets shall be at least three-quarters of an ich in depth and the actual bearing of the glass shall be at least five-eighths of an inch. The head of the frame shall be closed at the top and the piece forming this closure shall be securely fastened to each side at all points. The sill shall be filled with concrete or other incombustible material. Movable sash shall have stiles and rails of the thickness and width of at least one and three-quarters inches and shall be securely fastened together at each corner and so constructed that they will correspond in construction with the frame at the point of contact.
- (d) Lifting or sliding sash shall be counterweighted so as to balance. The sash weights shall be properly separated by parting strips in the boxes containing them, and shall be accessible through the jambs of the frame. Such sash shall be provided with metallic sash chain or cable and smooth running sash pulleys securely riveted or bolted in place. The sash chain or cable shall be of sufficient strength to withstand severe heat without parting, and be thoroughly protected against moisture and corrosion. The sash shall be fitted into the frame with suitable stops and parting beads of metal. Sash shall be removable. Meeting rails of the sash shall be so constructed as to prevent the passage of heat and flame. The sash shall be equipped with one or more substantial sash locks securely riveted or bolted in place.
- (e) Horizontally pivoted sash shall be riveted above the center on steel pivots at least three-eighths inch in diameter. Pivots shall work in brass eye plates securely riveted in place. Frames shall be reinforced where the pivots enter by riveting on one-eighth inch iron strips, so drilled as to receive the pivots. Such sash must be provided with suitable stops and an effective attachment for holding them open or closed. Such sash shall be provided with a substantial gravity lock or latch at top and bottom which will be positive in action. Where the lower sash is stationary or where two pivoted sash are used the transom bar dividing the upper from the lower sash hall be so constructed that it will not warp or bulge materially under heat or rapid cooling. Where rails and transom bars are used they shall be made so as not to be easily affected by rust and so as to afford ample weatherproof qualities.
- (f) Vertically pivoted sash shall comply generally with the requirements for horizontally pivoted sash. If the entire window is pivoted in one sash, such sash must be constructed in such manner as to afford stiffness, and in such manner as to prevent warping under heat.
- (g) Hinge sash or casement windows must be hinged with heavy brass hinges and a substantial brass latch or lock securely bolted in place. Such sash shall be constructed so as to fit the frame closely and afford ample weatherproof qualities at all points. They shall be provided with stops and fastenings necessary to prevent warping under heat.

- Where the area of wall openings is (h) in excess of 5 by 9 feet, the metal frames containing the sash or glass must be reinforced at every point of division by not less than five-inch "I" beams securely fastened beams securely fastened into the brickwork, proper allowance being made for expansion of the beams when heated. "I" beams shall be protected on the flanges with at least two inches of tile, concrete, or other material approved by the Commissioner of Buildings, and next to the web with at least two and one-half inches of such material, which thickness shall be increased on large beams. Metal frames shall be securely attached to the reinforcing
- (i) Electro-glazed prism glass may be used in lieu of wired glass, when approved by the Commissioner of Buildings as to material and construction of same, providing the frames and sash of same comply with the requirements of this section for wired glass window frames and sash.
- This section shall not apply to frame buildings nor to buildings outside the fire limits twenty-eight hundred square less in area, nor to buildings of one story in height, nor to buil height, nor to buildings of Class II not more than two stories in height, nor to store windows in the first story, where the same are located on an alley and not more than sixteen feet from the street.
- Openings Inserted.) (a) Wherever openings are to be inserted in dividing walls, as 573. Dividing Walls and Iron Doorsbefore described, or in dividing walls be-tween non-fireproof and fireproof buildings, or parts of either of such buildings, they

or parts of either of such buildings, they shall be made as follows:

(b) Such doors may be either sliding doors or swinging doors, and shall be so constructed, installed and maintained that they can be easily opened or closed from either side at all times by any person; provided between realiting steel shutters may vided, however, rolling steel shutters may be used when such openings are not used as exits.

(c) Every such door shall be equipped with a device containing a fusible link or other releasing arrangement of equal effi-

ciency, approved by the Commissioner of Buildings. There shall be one of these immediately above the door opening and one above the opening near the ceiling. Where above the opening near the ceiling. Where the ceiling is less than three feet above the door opening, the last mentioned fusible link or releasing device may be omitted, if the doors are so arranged that the opera-tion of any one of the thermostats, or other releasing devices, will result in the closing of the doors on both sides of the walls. Fusible links, or other approved substitute, shall be made so that they will fuse or operate when subjected to a heat of 160 to 165 degrees Fahrenheit. If said doors are of steel plate, the plate or plates shall be of No. 12 U. S. gauge or greater thickwith a three-eighths inch angle iron frame extend-ing all around the same and two by two by

continuous two by two by three-eighths inch panel bars not exceeding twenty-four inches apart, riveted to the plate of the door with not less than three-eighths inch rivets spaced four inches to six inches between centers. Pairs of swinging doors shall be so constructed that when the doors are closed, they will be of strength equal to that of a single door, and shall be so arranged that they will operate automatically. All doors shall be hung on wall frames of four by three by three-eighths inch angle iron or of four by threeeighths inch angle from or of four by three-eighths inch bar iron stiffened by one and one-half by one and one-half by one-fourth inch angles riveted on the back and fitting snugly to the wall. The frame shall be fastened together by three-fourths inch bolts ovtending through the wall such bolts.

extending through the wall, such bolts be-

ing not more than two feet apart. All doors to be made to fit closely to the wall frame on all sides. Lintels of door openings shall be made of brick, iron or concrete.

- (d) Swinging iron doors shall swing three wrought from hinges made of two by three-eighths inch bar iron and shall be secured by at least three lever bars of one and one-half by three-eighths inch iron, working together and so arranged as to be operated on either side of the door.
- (e) Sliding iron doors shall slide in channels at the top and bottom; bottom channels shall be formed by two angles two and one-half by three-eighths inch and one and one-half by one-fourth inch; top channels to be formed by two angles two by three-eighths inch and one and one-half by one-fourth inch; channels shall be securely one-tourth men, channels share well frame and where they extend beyond the wall frame shall be firmly bolted to the wall by expansion bolts. Track shall be without expansion bolts. Track shall be without incline, of one-half by one-half inch iron securely riveted on the upper side of the angle iron channel. Hangers shall be of the anti-friction pattern and securely fas-tened to the door plate by at least four one-half inch bolts. Wheels shall be of cast iron three-fourths by four and one-half inches.
- (f) Sills between iron doors shall be of one-fourth inch iron or steel with edges securely fastened to one and one-half by one and one-half by one-fourth inch angle iron or heavier, on the inner side of the wall frame. Where adjoining floors are of con-crete construction, sill plates may be
- (g) When tin-clad doors are used shall be made of three thicknesses of thir-shall be made of three thicknesses of thirteen-sixteenths inch seasoned, non-resinous wood, of good sound quality, free from sap and large or loose knots, tongued and and large or loose knots, tongued and grooved, dressed on both sides and not exceeding eight inches in width. The outside layers shall be vertical, the inside layer shall be horizontal; layers shall be securely fastened togetheer by wrought iron clinch roots divisor in this and clinched so as to nails driven in flush and clinched so as to leave smooth surfaces. The woodwork shall be thoroughly covered with terne plate tin of size fourteen by twenty inches, weighing not less than one hundred and thirteen pounds per box of one hundred and twelve sheets; all joints shall be locked one-half inch and nailed under seams, except on edges of door; vertical joints shall be double locked, horizontal joints single locked. Nails used to fasten tin shall be No. 13 gauge, flat head, full barbed wire, two inches long.
- (h) Swinging tin-clad doors shall have three-eighths by two and one-half inch wrought iron hinges bolted to doors with four three-eighth inch bolts. Doors in excess of seven feet in height shall be provided with three hinges and have wrought iron wall eyes built in wall, or riveted to wall frame, or bolted through wall with three-fourth inch bolts. They shall have at three-fourth inch bolts. They shall have at least three level bars of one and one-half by three-eighths inch iron working together; the latch shall be placed so it can be operated from either side of the door and pro-vided with proper keepers bolted through the door, with the spring to insure latching; catches shall be made of one-half inch wrought iron securely bolted to wall or wall frame.
- (i) Sliding tin-clad doors shall have tracks inclined three-fourths inch to the foot, made of three and one-half by three-eighths inch rolled steel, or round bars, or round pipes of equal strength, selcurely bolted through wall with three-fourths inch Hangers shall be made of threebolts. eighths by three and one-half inch wrought

iron attached by not less than one-inch bolts. Wheels shall be of malleable or wrought iron with not less than one and one-half inches bearing on axle. Doors over six feet wide shall have three bangers and shall be provided with processory. Find and shall be provided with necessary bindchafing strips, bumpers and bumper

(j) Sills between tin-clad doors shall be of one-fourth inch iron or steel riveted to a three and one-half by five by threeeighths inch angle iron on each side of the wall; angle irons to be fastened together through the wall by three-fourths inch bolts spaced not to exceed eighteen inches apart; provided, that where adjoining floors are of concrete construction, sill plates may be omitted.

(k) Rolling steel doors used as dividing wall doors shall be made either of wooden slats covered with steel or bronze, or of number 20 U. S. gauge painted steel, or of number 24 U. S. gauge galvanized steel, The edges of such doors shall run in steel channels not less than one and one-half inches deep, and three-sixteenths of an inch in thickness.

(1) Such doors shall be hung on winding shafts and helical springs of sufficient strength to counterbalance the door at any position, and shall be equipped with a device to hold the doors in a closed position if the spring is destroyed. The head of the spring is destroyed. The head of e door opening shall have baffle plates of the door number 12 U.S. gauge steel, which shall be reinforced around the edges by one and onehalf inch angles, to act as fire and smoke The openings for such doors shall stops. steel frames and sills as herein required for steel swinging doors.

574. Metal or Reinforced Concrete Canalysis in Fireproof Buildings—Air Space.) neys in Fireproof Buildings—Air Space.)
(a) Internal chimneys of rolled steel or iron may be built in buildings of fireproof construction, provided that the rolled steel shall be not less than three-eighths inch in shall be not less than three-eighths inch in thickness, except that the upper fifty feet of such chimney may be one-quarter of an inch in thickness, riveted in every joint, or of east iron, providing same shall not be less than three-fourths inch in thickness and jointed by bell and spigot joints or flanged bolted joints. All joints in east iron work shall be filled and pointed with fire clay. Such metal internal chimneys shall be securely and firmly appeared to the shall be securely and firmly anchored to the framing of such fireproof building at each floor line and at the roof. The lower part of each such chimney shall be lined with insulating lining for a height herein required for the respective area by Section 645 of this Chapter. The insulating lining shall of this Chapter. The insulating lining shall be one of the linings described in Section 580 of this Chapter.

Reinforced concrete not (b) 1688 (b) Reinforced concrete not less than four inches in thickness may be used on the interior of fireproof buildings, provided the requirements for reinforced concrete and for reinforced concrete stacks elsewhere required by this Chapter shall be

complied with.

(c) Internal metal or re-inforced concrete stacks on fireproof buildings shall be surrounded by continuous air space from the lowest story through the roof not less than four inches across at any point, and said air space shall be surrounded by brick, hollow tile, or reinforced concrete. No hollow tile, or reinforced concrete. No structural metal in such air space shall be without such fireproof covering.

Reinforced Concrete Chimneys -How Built.) Reinforced concrete chimneys in which the temperature of the gases is intended to exceed 750 degrees Fahrenheit, shall be lined with fire brick or magnesia or asbestos insulating lining for the height and in the manner elsewhere required by this Chapter. If the insulating is stopped anywhere below the top of a reinforced concrete chimney or if the cross section of such a chimney is changed, then the reinforcing shall be increased at such points sufficiently to prevent the formation of temperature cracks.

576. Tenement and Apartment House Boiler Chimneys.) Chimneys for the heat-ing apparatus of tenement and apartment houses shall not be considered as flues used for domestic purposes.

577. Height of Chimneys Above Roof.)
(a) The height of all chimneys and flues of stoves used for domestic purposes or open fireplaces shall be not less than five teet higher than the highest point of the toof of the building of which they are a part.

(b) The height of all chimneys and flues above the highest portion of the roof of which they are a part, where such chimneys or flues are used for other than domestic purposes or for open tireplaces, shall be determined by dividing the greatest diameter in inches by four, and the quotient thereby obtained in terms of feet, with five feet added, shall be the minimum height from the tops of such chimneys and flues above the highest portion of roof of the building. In no case shall the height of any chimney or flue be less than five feet above the roof of the building of which it is a part.

(c) The sum of the horizontal distance of any wood tank, pent house or roof house, on the same building of which any chimney shall be a part, and the vertical distance of top of such wood tank, pent house, or roof house, on the same building to a horizontal plane passed through the top of the chimney shall not be less than one and one-half times the required height of the top of the chimney above the roof. The tops of chimneys within a radius of twenty-five feet of any wood tank, pent house, or roof house, on the same building of which such chimney shall be a part shall be at least as high as the top of said wood tank, pent house, or roof house. The tops of chimneys on ridge roofs shall be not less than three feet above the ridge.

578. Insulating Cavities — Where Required.) All flues having a greater area than four hundred square inches shall be lined on the inside with an insulating ma-terial, which lining shall start at least two feet below the smoke inlet and shall extend upwards for at least ten times the diameter of the flue, or if said flue is not circular or square in cross section for ten times the average diameter, when the flues are of brick, stone or concrete, said insulating lining shall be fire clay brick or fire clay blocks, and if such bricks or blocks are four inches or more in thickness, they may be considered as a portion of the thick-ness required for the surrounding walls. The walls surrounding chimneys having an area greater than four hundred square inches shall have an insulating cavity not less than three inches wide surrounding the inner four inches of fire brick or fire clay blocks, for not less than the height required above for insulating lining and said inner core shall be built independent of the surrounding brick work and shall be free to expand or contract,

579. Metal Chimneys in Buildings of Ordinary Slow-Burning or Mill Construction.) Interior stacks or smoke flues of metal shall not be used in buildings of ordinary or slow burning or mill construction, unless they are suppressed by the construction, unless they are surrounded by self-supporting brick or re-inforced concrete walls of the thickness herein required for flues of the respective area; provided, however, that if an interior smoke pipe of steel of not less than three-eighths inch in thickness riveted in every joint, or an interior smoke pipe of cast iron not less than five-eighths inch in thickness is used, then the brick work required inside of the insulating cavity of a stack may be omitted, but such metal lings shall be lined with such insulating material for the height herein elsewhere required for stacks. If a chimney or stack is not a part of the walls of such a building, it shall be designed as an isolated chimney as required by Section 583 of this Chapter.

580. Insulating Material for Metal Chimps and Metal Stacks.) (a) Fire clay brick or fire clay blocks may be used for the insulating lining of metal chimneys and stacks but not of a lesser thickness than two inches. The material shall be increased in thickness or supported on structural steel ledges and the material shall be stressed not to exceed the safe limits of stress elsewhere herein fixed for the material, or metal chimneys and metal stacks may be lined with blocks of magnesia insulation or metal stacks or chimneys may be lined with any other insulating material tested and approved by the Commissioner of Buildings.

(b) Magnesia block insulation shall contain not less than 45 per cent of magnesia and 50 per cent asbestos fibre formed into blocks not less than 1½ inches in thickness by hydraulic pressure. After said magnesia blocks have been set, they and all metal bands and ties exposed with the flue shall be plastered with cement not less than one-half inch in thickness on one and one-half inch blocks, and one-fourth inch in thickness on one and three-fourths inch and thicker blocks.

(c) Fused asbestos board shall be made of alternate flat and corrugated sheets of asbestos board, cemented together and fused under a heat of not less than 1,000 degrees Fahrenheit to a minimum thickness of 1½ inches. After said fused asbestos boards have been set into the flues, they and all exposed metal bands or ties shall be pointed with cement.

(d) Such magnesia blocks, fused asbestos boards, pointing cement and any other insulating material approved by the Commissioner of Buildings shall resist the disintegrating, dissolving, or diminishing action of moist steam and the acid and gaseous fumes present in the flue at any degree of heat obtainable by the combustion of the fuel used.

581. Chimneys — Interior — Framing Around.) In case of chimneys which are enclosed, or form part of the interior of any building, no joists or girders shall rest or be supported on the walls of such chimney, and the framing around chimneys of all kinds shall be so constructed that in no case will any joists or timbers be placed nearer than two inches from the outside face of walls of flues, and in no case shall the distance from the inside of any flue to any joists or timbers be less than seven inches.

582. Chimneys—External Location of.)
(a) Chimneys built outside of the walls of buildings shall not encroach upon any street or alley, and shall be built as follows:

(b) If at least one side of such chimney abuts entirely upon the wall of an existing building and the chimney is throughout its entire length securely and firmly anchored to the walls of such existing building, the wall of such chimney may be built of hollow tiles, in which case, however, it shall have a cast iron base, lined with fire brick, extending to a height of at least ten feet above the street or alley grade.

583. Chimneys—Isolated—Walls Surrounding Smoke Flues.) Isolated chimneys shall be kept at least twelve inches be so designed and constructed that the stress in every part thereof, due to the diately over and for a distance of two feet

weight of the stack itself and from wind pressure, shall not exceed the safe limits as provided in this Chapter for the material used.

Walls Forming Smoke Flues.) The walls forming smoke flues of one hundred and forty-four square inches area or less shall be of brick, concrete, stone, any one of these and burnt fire-clay flue tile lining, and such flue linings shall extend from the lowest opening to a distance of at least two feet materials is used it shall not be less than eight inches in thickness. Provided, however, that such flues having walls at least three inches in thickness of continuous concrete or interlocking or rabbited joint concrete sec-tional flues may be used without burnt fireclay flue tile linings. If any one of the above materials is used in combination with burnt fire-clay tile flue lining it shall be not less than four inches in thickness, and the burnt fire-clay flue lining shall be not less than three-fourths inches in thickness, built as herein described. The walls form-ing smoke flues of more than one hundred and forty-four square inches area and not more than three hundred square inches area shall be of brick, concrete, stone, or any one of these and burnt fire-clay flue tile lining. If any of the above materials is used alone, it shall be not less than thirteen inches in thickness. If any one is used in combination with burnt clay flue tile lining, it shall be not less than nine inches in thickness and the fire-clay flue tile lining shall be not less than three-fourths inch in thickness and built as herein required. walls forming flues having an area greater than three hundred square inches and less than six hundred square inches shall be built of one of the materials described above not less than twelve inches in thickness, and flues having an area greater than six hundred square inches shall have walls of one of the materials described above not less than sixteen inches in thickness, and these walls may be reduced to twelve inches these wans may be reduced to twerve inches in thickness at a point not less than fifty feet above the top of the breeching; provided, however, that the material of which all chimneys are constructed shall be so proportioned that it will not be subjected to a greater stress than elsewhere herein fixed as the maximum safe stress for such material. \*Amended February 20, 1911 material. \*Amended February 20, 1911.

585. Ventilating Ducts—Chutes—Walls Forming.) Walls forming ventilating ducts and rubbish and ash chutes shall be constructed in accordance with the regulations governing the construction of smoke flues elsewhere herein contained. Walls forming ventilating ducts shall not be less than four inches thick, and when the ventilating duct is larger than two hundred and sixty square inches the walls shall be not less than eight inches thick.

586. Smoke Pipes Passing Through Partitions—Woodwork Around.)
(a) Where smoke pipes of diameter of six inches or less pass horizontally through a wood or a plastered stud partition, they shall be surrounded by a ventilated thimble of incombustible material with a diameter at least twelve inches greater than the diameter of the pipe.

(b) Where a smoke pipe of a greater diameter than six inches passes through a wood or plastered stud partition, it shall be surrounded either by a body of brick, hollow tile, porous terra cotta or other incombustible substance, measuring at least eight inches all around such smoke pipe. Smoke pipes of less diameter than twelve inches shall be kept at least twelve inches distant from any combustible partition, ceiling or floor, and such woodwork immetiely over and for a distance of two feet

on each side of such smoke pipe shall be covered with sheet metal or with porous

terra cotta, hollow tile or plaster.

(c) Smoke pipes of greater diameter than twelve inches and less area than six square feet, shall be kept at least twenty inches away from any woodwork. Such woodwork shall be protected as above specified for smaller smoke pipes to a distance of four feet on each side of such smoke pipe; provided, that in case of low pressure boilers used for heating purposes only, the distance from a smoke pipe to any woodwork shall not be less than two feet.

not be less than two feet.

(d) Whenever smoke pipes of larger area than six square feet are used, they shall be kept at least three feet distant from any woodwork, and such woodwork for a distance of at least six feet on either side of such smoke pipes shall be protected as be-

fore specified for smaller pipes.

587. Floors—Protection of—Around Boilers, Furnaces, Etc.) Wherever steam boilers, furnaces, ovens, coffee roasters, or other structures in which fires are maintained, except stoves for domestic purposes standing on legs and affording not less than four inches air space, are set inside of a building, the floors under the same if not already fireproof, shall be taken out and replaced by a floor of fireproof material extending not less than six feet in each direction from the boiler or such other appliances.

- 588. Ceiling-Protection of-Around Boilers, Furnaces, Etc.) The space between the tops of all steam boilers and furnaces and any wood ceiling construction shall in no case be less than three feet, unless such boiler carry not more than ten pounds pressure, in which case such space shall be not less than eighteen inches. All wood sheathing, wood laths or other combustible ceiling finish, shall be removed from above and for a space of two feet on all sides of such boilers and smoke pipes and the ceiling given at least two coats of whitewash or fire-retarding paint, and the top of such boilers and the top and sides of such smoke pipes shall be covered with at least three inches of asbestos cement or two inches of eighty-five propert means in eighty-five percent magnesia and an outer covering of one-half inch asbestos cement. or such equivalent protection as may be approved by the Commissioner of Buildings: or the under side of such wood ceiling con-struction over the boiler or furnace and also over the smoke pipe leading from same and extending at least two feet in each direction beyond the boiler or furnace and smoke pipe shall be protected either by three coats of plastering on metallic lath or wire netting, or at least two inches of porus terra cotta or hollow tile covered on the under side with a heavy coat of plaster. metal is used in the construction of smokesuch metal shall be of thickness not pipes. less than No. 14 U.S. gauge,
- 589. Boilers—Location of—Permit for.) In all cases, boilers shall be so placed as to give ample room between any ceiling, wall or partition to connect or operate any valves or pipes or other connections used on such steam boilers. The size, number and location of boilers to be installed in any building shall be marked on the plans and, except in buildings of Class III, approved by the Department of Smoke Inspection of Steam Boilers and Steam Plants, and by the Department of Smoke Inspection, before a permit is issued by the Department of Suildings for the erection of such building.
- 590. Cupolas of Foundries.) Cupolas of foundries shall extend at least twenty-five feet above the highest point of any roof within a radius of forty feet of such cupola.
- 591. Cornices Eaves Gutters Pipes from Roof.) (a) No wood shall be used for any purpose in connection with cornices,

eaves and external gutters on any building more than fifty feet in height. The entire exterior covering of cornices and eaves of buildings hereafter to be erected within the tire limits shall be of incombustible material.

- (b) Wherever sheet metal cornices or eaves or external gutters are used, their entire exterior covering shall be of metal or other incombustible material approved by the Commissioner of Buildings. Bracket supports for same shall be firmly secured to the wall at least every four feet, and the walls shall be carried full height under and behind same throughout their entire length.
- (c) The water from all roofs shall be carried to the sewer in metal conductor pipes. Every such conductor shall be continually maintained in good condition, and if such conductors are within the exterior walls, they shall be of screwed-joint iron or steel pipe, or of cast iron pipe with calked joints.
- 592. Towers, Domes and Spires—Construction of.) Towers, domes and spires may be built on top of the roofs of buildings, but shall not occupy more than onequarter of the street frontage of any building. Such towers, domes, or spires, if any part thereof is built to a height of more than fifty feet and less than ninety feet, shall be of slow-burning construction, and, if of a greater height then ninety feet above the sidewalk, shall be of fireproof construction; and, in all cases where the area of such tower, dome, or spire exceeds one hundred square feet, its supports shall be carried down to the ground, and shall be, if the structure supported is more than fifty feet and less than ninety feet high, of slow-burning construction, and, if more than ninety feet high, of fireproof construction. No tower, dome, or spire shall exceed thirty-six hundred (3,600) square feet in area, and in no case shall the area exceed fifteen per cent of the total area of the building on which it is erected, nor shall the height of any tower, dome or spire exceed four hundred feet measured from the established inside grade.
- \*592a. Structures—Construction and Limitations of.) All structures built within the City other than those otherwise specifically provided for herein shall be designed and constructed according to established engineering practice, and shall comply with the provisions of this section. No structure of frame or mill construction within the fire limits shall exceed 35 feet in height from the ground to the highest point thereof. No structure of mill or frame construction outside the fire limits shall exceed the height of 45 feet from the ground to the highest point thereof.
- \*All structures over thirty-five feet in height within the fire limits, and all structures over forty-five feet in height outside the fire limits shall be built of structural steel, concrete or musonry: provided, however, that viaducts or runways to be used for the purpose of transferring livestock from one building or place to another may be built of wood not to exceed eighty feet in height either within or without the tree limits.
  - \*Amended July 22, 1912.
- If it is desired to enclose any structure, such structure shall be enclosed with concrete or masonry walls, or incombustible material of such construction as shall be approved by the Commissioner of Buildings; provided that structures outside the fire limits not exceeding 2.800 square fect in area, or 45 feet in height, may be enclosed with combustible material.

In every structure contemplated by this section, safe and adequate means of ingress and egress shall be provided for persons employed in and about the same.

All structures whose height exceeds twice their least dimensions at their base shall be so designed as to safely resist a wind pressure of 30 pounds per square foot of surface exposed to the action of the wind.

593. Skylights—Construction of—Glass in.)
(a) Any skylight on the roof of any building less than ninety feet in height, other than a frame building, shall have the sides, sashes and frames constructed of metal, or of wood, metal clad on all exterior surfaces. Any skylight on a building more than ninety feet in height shall be entirely of incombustible material.

(b) Every skylight shall be provided with ventilation opening of an area of at least three per cent of the base area of the

skylight.

- (c) The glass in all such skylights, except in buildings in Classes III and VI, not exceeding three stories in height, shall have at least six inches over same a strong wire netting with wire not lighter than number twelve gauge, galvanized after weaving, and mesh not coarser than one by one inch, unless the glass contains a wire netting within itself. Supports for screen shall not be less in size than the bars supported and of the same material.
- 594. Enclosures Upon Roofs.) It shall be permitted to erect on the roofs of all buildings more than fifty feet and less than minety feet high, skylights, inclosures for water tanks and inclosures for elevator machinery, the construction of all of which inclosures shall be entirely of incombustible material; provided, however, that the roofs of same may be built of mill or slow-burning construction.
- 595. Roof-Construction of-Pitch Buildings, other than frame buildings when permitted by this Chapter, less than fifty feet in height with roofs which have a slope of more than three inches per horisome of more than three menes per norte zontal foot, shall have the roofs covered with incombustible material. Buildings more than fifty feet and less than ninety feet in height with roofs which have a slope greater than three inches per horizontal foot and which are of timber construction, shall have such roofs covered with an incombustible covering upon the roof boards, which shall be made either of mortar or porus terra cotta or plaster boards or other porus terra cotta or plaster boards or other incombustible material, which shall be at least two inches thick. Where this covering is placed upon the roof boards wooden strips shall be inserted, which shall be sequently featured to the wooden structures. curely fastened to the wooden structure at regular intervals between the incombustible covering and a weatherproof covering of incombustible material.
- 596. Roofs—Shingle or Gravel.) (a) The use of shingles or other forms of combustible roof covering erected or altered, otherwise than provided in Section 657, within the fire limits, is prohibited, except as heremafter provided. In existing frame buildings not more than three stories high, the shingle roofs may be repaired with shingles or other materials.
- (b) Roofs, the slope of which is not more than three inches per foot horizontal, and the covering of which is made of a composition of felt and gravel, shall be considered incombustible under the provisions of this Chapter, and may be used more buildings of all classes. Other forms upon buildings of all classes. Other forms of composition roof shall be permitted if expressly approved as an incombustible roof by the Commissioner of Buildings.
- 597. Window and Door Sills-Columns and Lintels Supporting Store Fronts—Incombustible.) (a) For buildings other than frame buildings window and door sills shall be made of incombustible material. Oak timber used for door sills and not less than

eight inches thick by the full width of the wall in which such sills occur, shall, for the purpose of this Chapter, be counted incombustible.

(b) In buildings other than frame and excepting buildings of Classes III and VI, lintels shall be of incombustible material; provided that in one-story store front buildings columns and lintels may be of combustible material.

\*598. Buildings—Height of.) (a) The limits of heights of buildings heretofore given for non-freefroof buildings shall be from the average established s devealk level to the highest point of

firefroof vuluans, which could be stablished sidewalk level to the highest point of the roof thereof.

(b) The height of firefroof buildings shall be measured from the average grade of the street frontage of the building to the top of the highest point of the external bearing walls.

(c) No buildings shall be erected of greater height than two hundred feet from the sidewalk level to the highest point of external bearing walls; provided, however, that buildings may be erected of a height of two hundred sixty feet from the sidewalk level to the highest point of external bearing walls up to and until the first day of September, 1011, where a permit has been secured therefor and the work incident to the erection of sad building has been begun before September first, 1011. The erection of parapet of the sort of bulustrades constructed entirely of exection of sad building has been begun before September first, 1011. The exection of parapet walls or of bulustrades constructed entirely of incombust ble material shall be permitted above the roof level of buildings of all classes, in addition to the height fixed herein for the same, (d) Roof hous's for elevators, tunks, skylights, stairs or senttles may be built above the height of the main roof.

\*Amended February 6, 1911.

- 599. Basement and Cellar Defined.) basement shall be defined as a story the floor of which is more than two feet below Hoor of which is more than two feet below the average finished street grade or whose ceiling is less than nine feet above said grade at the front of the building; but this definition of a basement shall not apply to buildings of Classes VI and VIII.
- 600. Sub-basements and Cellars—Construction of.) (a) No building shall have more than one basement or cellar of ordinary or slow-burning, or mill construction; all additional basements or cellars shall be of fireproof construction as described in this Chapter, the elevator enclosures shall be of brick from the lowest basement floor level to the first story floor, and the stair-ways shall be inclosed in fireproof partitions from the lowest basement floor level to the first story floor level with automatic closing standard iron doors, opening outwards.

(b) In cases where a pipe, conduit, dumb-waiter, cable, wire, conveyor or belt, or any combination thereof, passes through a floor from one basement to another, the opening in the floor shall be inclosed as specified in this Chapter.

(c) The number and width of stairs from the lowest basement floor to the first story shall be the same as required for the four highest stories of a building of the same area.

- Canopy-Plans Must Be Approved 601. by Commissioner of Buildings Before Permit Issued by Department of Public Works.) In the last by Department of Public Works.) It shall be unlawful for any person, firm or corporation to erect or construct any canopy under any general or special ordinance which shall or may hereafter be adopted by the City Council of Chicago without first submitting the plans of such canopy to the Commissioner of Buildings for his approval. No permit shall be issued by the Department of Public Works for a by the Department of Public Works for a canopy unless the plans of said canopy shall bear the approval of the Commissioner of Buildings.
- 602. Courts and Light Shafts in Buildings.) (a) Every court or light shaft of every building shall be open and unob-

structed from the bottom of such court to the sky, with the exception that fire escapes may be built therein, and such courts shall have walls constructed in the same manner as is required for the exterior walls of such buildings; provided, that no walls inclosing such courts are required on street

or alley lot lines.
(b) All windows, doors or other openings in court walls, except as otherwise provided in this Chapter, shall have metal frames, metal sashes and metal doors, with the glazed portions thereof of wired glass.

603. Bay Windows—Light Courts—Shafts—Construction of.) (a) The walls of every bay window and every court in every masonry constructed building, except buildings of Class III, shall be built of brick or other fireproof construction throughout as quired for exterior walls.

(b) The walls of every vent shaft of every masonry constructed building, except buildings of Class III, shall be built of masonry or a fireproof material not less than four inches in thickness supported by

steel or iron.

(c) Every court, light shaft, or vent shaft in every building shall be open and unobstructed from the bottom of such court to the sky with the exception that fire escapes may be built in courts or light shafts, subject to all the provisions of this Chapter.

(d) All windows, doors, or other openings in court walls, except as otherwise provided in this Chapter, shall have metal frames, metal sashes and metal doors with the glazed portion thereof of wired glass.

604. Windows, Cleaning of—Safety Devices.) The owner or agent of every building in the city shall equip each and every window in any such building above the first story thereof with a suitable device or devices which will permit the cleaning of the exterior of each and every window in such building above the first story without danger to the person cleaning such win-dows, and such devices shall be of such pattern and construction as will reasonably and safely answer the purposes for which they are intended; provided, however, that if windows are of such construction that they may be easily cleaned from the inside they need not be equipped with such devices.

605. Wood Lath.) In all buildings of ordinary construction where the use of wood lath and plaster is permitted under the provisions of this Code, such wood lath and plaster shall be done in accordance with

these specifications:

Wood lath shall not be over 11/2 inches wide and shall be nailed to each stud, joist wide and shall be halled to each stan. Jose or bearing with not less than a three-penny fine 16-gauge nail. Lath to have joints broken with not over seven lath to a break. Lath to be spaced not less than <sup>1</sup>4-inch apart. All wood lath must be covered with at least two coats of plaster, such lath and plaster to finish to a total thickness of at least 7, of an inch. No dirt or loamy sand to be used in the mortar or plaster.

sand to be used in the mortar or plaster.

600. Scaffolds—Protection During Building Operations—Temporary Floors.) (a) All
scaffolds erected in this city for use in the
erection, repair, alteration, or removal of
buildings, shall be well and safely supported, and of sufficient width, and properly
secured, so as to insure the safety of persons working thereon or passing under or
by the same; and to prevent the falling
thereof, or of any material that may be
used, placed or deposited thereon.

(b) It shall be the duty of every owner

(b) It shall be the duty of every owner, person or corporation who shall have the supervision or control of the construction of or remodeling of any building having more than three framed floors, whether some or all of such floors are above the established street grade, to provide and lay upon the upper side of the joists or girders, or

both, of the first floor below the riveters and structural steel setters, a plank floor, which shall be laid to form a good and substantial temporary floor for the protection of the employes and all persons engaged above or below or on such temporary floor in such building.

(c) Provided, however, that where the permanent floor is in place on the floor herein required to be planked, a temporary protective floor shall not be required.

(d) A good and substantial temporary floor shall be laid on the joists or girders of the next lower floor where the temporary or permanent floor of the second story or the floor or floors above the second story roof is being placed previous to the placing of the permanent floor or floors immediately below the floor which is being arched or planked. The lowest framed floor in a building shall be considered the first floor.

(e) In buildings more than three stories high where persons are working on a scaf-fold or scaffolds on the outside of such building such persons shall be protected by well secured planking, set over the heads of such persons for the full width of the scaffolding on which they are working if another story or other stories are being raised above such persons during the time they are working on such outside scaffold or scaffolding.

or scaffolding.

or scaffolding.

(f) It shall be the duty of all owners, contractors, builders or persons having the control or supervision of all buildings in course of erection which shall be more than the feet high to see that all stairways, thirty feet high, to see that all stairways, elevator openings, flues and all other openings in the floors shall be covered or properly protected, and it shall be their further duty to comply with an act of the State duty to comply with an act of the State Legislature providing for the protection and safety of persons in or about the construction, repairing, alteration or removal of buildings, bridges, viaducts and other structures, approved June 3, 1907, and in force July 1, 1907 July 1, 1907.

(g) Any person, firm or corporation vio-

lating any of the provisions of this section shall be fined not less than one hundred dollars nor more than two hundred dollars for each offense, and any permit granted for the construction of such building may be revoked in the discretion of the Commissioner of Buildings where such violation

occurs.

607. Sidewalk and Street—Occupation of —Limitations.) (a) The extent of occupation of sidewalk and street to be covered by the terms of a permit for street obstruc-

tion or building, shall be as follows:

(b) Such permit shall not authorize the occupation of any sidewalk or street or part thereof other than that immediately in front of the lot or lots upon which any building is in process of erection and in relation to which such permit is issued.

During the progress of building operations, a sidewalk not less than six feet width shall be at all times kept open and unobstructed for the purpose of passage in front of such lot or lots. Such sidewalk shall, if there are excavations on either Such sidewalk side of the same, be protected by substantial railings which shall be built and maintained thereon so long as excavations continue to exist. It is not intended hereby to prohibit the maintenance of a driveway for the delivery of material across such sidewalk from the curb line to the building site.

Sidewalks—Delivery of Materialfor the purposes of delivering material to the basements of buildings in process of erection to erect elevated temporary sidewalks to a height of not exceeding four feet above the curb level of the street, and in case a sidewalk is so elevated it shall be

provided with good, substantial steps or easy inclines on both ends of the same and shall have railings on both sides thereof.

609. Temporary Roof Over Sidewalk—
Time Maintained.) When buildings are erected of a height greater than four stories and such buildings are near the street line, there shall be built over the adjoining sidewalk a roof having a framework composed of supports and stringers of three by twelve timbers not more than four feet from central strings of the supports and stringers of three by twelve timbers not more than four feet from central strings. timbers not more than four feet from center to center, covered by two layers of twoadded to When additional stories are inch plank. When additional stories are added to an existing building and such building is located near the street line, there shall be built over the sidewalk, at the point where the new stories commence, a scaffold not less than six feet wide, which shall form a covering over the sidewalk composed of a framework of stringers and supports, covered by two layers of two-inch planks. Such framework and covering shall be of such construction and design as shall be satisfactory to the Commissioner of Buildings. Such roof shall be maintained as long as material is being used or handled on such street front above the level of the sidewalk. Temporary sidewalks, their railings, approaches and roofs over same, shall be made with regard to ease of approach, strength, and safety, to the satisfaction of the Commissioner of Buildings.

- 610. Storage of Building Materials— Limitations.) The occupation of the street for the storage of building material for any one building or for temporary sidewalks, shall never exceed one-third of the width of the roadway of the same, and in no event shall any material be stored or placed within four feet of any steam or street railway track, and in all cases where such obstruction of the street is made there shall be a tion of the street is made there shall be a clear space of not less than one foot between such obstruction and the curb line. Provided, that the Commissioner of Buildings and the Commissioner of Public Works, or either of them, may limit, or entirely restrict, the storage of material on any street or alley where a tunnel, conduit, or any underground passageway or subway is located.
- 611. Sidewalks and Street - Excavated Material and Rubbish On—How Cared for.)
  Earth, other than sand to be used in the censtruction of the building, taken from excavations, and rubbish taken from buildings shall not be stored either upon the sidewalks or roadways of streets, and shall be removed therefrom from day to day as rapidly as produced. When dry rubbish is being handled, it shall be kept wetted down so as to prevent its being blown about by the wind.
- 612. **Use of Derricks.)** For all buildings more than four stories in height the use of derricks set upon the sidewalk or street is prohibited. In no case shall the guy lines be less than fifteen feet above the roadbed.
- 613. Frontage Adjacent—How Occupied for Building Purposes.) If the written consent of and a waiver of claims for damages against the city by the owners of properties adjoining the site of any proposed building is first obtained and filed with the Commissioner of Public Works, the permission to occupy the roadway and the sidewalk may be extended beyond the limits of such buildoccupy the roadway and the Shuewark may be extended beyond the limits of such building in front of the property for which the consent of the owner or lessee thereof has been secured upon the same terms and consent of the consent of ditions as those herein fixed for the occu-pation of sidewalk and street in front of the building site.
- 614. Street—Use of for Building Purposes—When Terminated—Red Lights.) (a) The permission to occupy streets and sidewalks for the purposes of building is in-

tended only for use in connection with the actual erection, repair, alteration or retended only for use in connection with the actual erection, repair, alteration or removal of buildings, and shall terminate with the completion of such operation. It shall be unlawful to occupy any sidewalk or street after the completion of the operation for which a permit has been issued by the Department of Buildings. It shall also be unlawful to occupy a sidewalk or street. under authority of such permit, for the storage of articles not intended for immediate use in connection with the operations for which such permit has been issued.

(b) Red lanterns shall be displayed and maintained during the whole of every night at each end of every pile of material in any street or alley and at each end of every excavation

615. Street Obstructions—Permits—Bonds—Fees.) (a) Permits for the obstruction of streets shall be issued by the Commissioner of Public Works and shall be paid in proportion to the street frontage occupied at the rate of two dollars per month for every twenty-five (25) feet, or fractional part thereof of frontage so occupied and part thereof, of frontage so occupied, and before any permit shall be granted to any person, firm or corporation for the obstruc-tion of any street or streets or sidewalk, an estimate of the cost of restoring said street and sidewalk to a condition equally as good as before it shall have been obstructed, with a fair additional margin for contingent damages, shall be made by the Commissioner of Public Works, which in no case shall be less than one dollar per foot, or fractional part thereof, frontage of the portion of the street to be obstructed, and a deposit shall be required of the person, firm or corporation desiring to obstruct said street or sidewalk. Such deposit, less the charge of two dollars per month for each twenty-five feet of frontage used, shall be returned upon the restoration of the said street and sidewalk to a condition equally as good as before it was obstructed. When the Commissioner of Public Works shall re-ceive satisfactory proof that said street and sidewalk have been restored to a condition equally as good as before it was obstructed, he shall issue a certificate to the Comptroller, certifying to said fact, and the comp-troller shall thereupon forthwith issue a warrant on the City Treasurer for the amount of money thus deposited less the deduction herein provided for. But if the person, firm or corporation thus obstructing said street or sidewalk shall fail to restore the same to a condition equally as good as before it was obstructed within three (3) days from and after the completion of the building or structure for which said posit was required, then the city shall have the right to use such portion of said deposit as may be necessary to remove the obstrucas may be necessary to remove the obstruc-tions and to restore the said street and sidewalk to a condition equally as good as it was before it was obstructed, and the amount thus expended shall be deducted from the amount of said deposit; provided, however, that nothing herein contained shall preclude the city from maintaining an action against the person, firm or corporaaction against the person, irm or corpora-tion to recover for damage done to any street or sidewalk. No permit shall be issued until the applicant therefor shall have executed and filed with the Commis-sioner of Public Works a bond, with sureties to be approved by said Commissioner, and in an amount to be designated by him, in no case to be less than ten thousand dollars, conditioned to indemnify, save and keep harmless the city from any and all loss, cost, expense or liability of any kind whatsoever which it, the city, may suffer or be put to, or which may be recovered from it from or by reason of the issuance of such permit, or by reason of any act or thing done or neglected to be done under

or by virtue of the authority given in such permit and the requirements of the city ordinances.

(b) Any permit issued pursuant to the terms of this ordinance may be revoked by the Commissioner of Public Works at any

616. Stables and Barns—Regulations.)
(a) It shall be unlawful for any person, firm or corporation to convert any building for the use of or to construct any stable or barn for the housing or keeping of horses or other animals on any lot abutting on a street or alley in which a public sewer is constructed without providing said stable or barn with an impervious floor properly drained to such sewer.

(b) It shall be unlawful for any person, firm or corporation to construct or locate any boarding sales, or private stable or barn on the front two-thirds of any lot on any street where one-half of the buildings on both sides of the street between the next nearest intersecting streets are used exclusively for residence purposes.

617. Tannery Not to Be Placed Within 600 Feet of Any Church, Public or Private School.) It shall be unlawful for any person, firm or corporation to build, construct, locate or maintain any building used, or to be used, for a tannery within six hundred feet measured from the nearest point of the tannery to the nearest point of any building used for a church or for a public or private school.

- 61714. Gas Reservoir Not to Be Placed Within 500 Feet of any Public School.) It shall be unlawful for any person, firm or corporation to build, construct, locate or maintain any tank used or to be used for a gas reservoir within 500 feet of any public school. Said distance to be measured from the nearest point of the building or structure used for a gas reservoir to the nearest point of any building used for a public school.
- 618. Architect—Must Certify That Plans Comply With Building Ordinances.) It shall be unlawful for any architect or other person permitted under the state law to prepare plans to prepare and submit to the Commissioner of Buildings for his approval any final plans for any building or structure which do not comply with structural requirements of this Chapter. It shall be the duty of the Commissioner of Buildings to require that all final plans submitted to him for approval of any building or structure shall be accompanied by a certificate of such architect or such other person preparing plans that the plans and specifications sub-mitted comply with the structural require-ments of this Chapter.

## ARTICLE XIII.

Fireproof Construction.

\*619. Fireproof Construction—Definition of.) The term "irreproof construct on" shall apply to all build ugs in which all parts that corry weights all build ngs in which all parts that carry aeights or resist strains and also all exterior walls and all interior partitions and all interior partitions and all stairways and all elevator inclosures are made entirely of incombinishly material, and in which all metallic structural members are protected against the effects of fire by coverings of a naterial which shall be entirely incombined by, and a slow heat conductor, and hereinafter termed "fireproof material." Reinforced concrete as defined in this ordinance shall be considered fireproof construction, when built as required by Section 564.

\*Amended February 20, 1911.

620. Fireproof Material—Definition of.) The materials which shall be considered as filling the conditions of fireproof covering

are: First, burnt brick; second, tiles of burnt clay; third, approved cement concrete; fourth, terra cotta.

621. Fireproof Construction—Tests For.)
(a) In cases in which it is claimed that any equally good or more desirable mode or manner of construction, or material, or device for fireproofing, other than specified in this Chapter, can be used in the erection or alteration of buildings, the Commissioner of Buildings, upon written application to him for a permit to use the same, shall have power to appoint a Board of Examiners, consisting of not less than three nor more than five members, each of whom shall have at least ten years' experience as an architect, engineer or builder, who shall take the usual oath of office. Said oath of office shall be administered by the Commissioner of Buildings. The said examiners shall adopt rules and specifications for examining and testing such mode or manner of construction or material, or device for fireproofing, and furnish a copy of the same to the applicant. And such specifications shall applicant. And such specifications shall provide that the material to be tested shall withstand successfully a fire of two hours' duration, rising to 1.700 degrees temperature, Fahrenheit, in the first thirty minutes and remaining at that temperature for the the end of following ninety minutes. At the end the two hours the material shall quenched with at least a 11%-inch stream of water for five minutes, at a nozzle pressure of fifty pounds per square inch. The said examiners shall notify such applicant to submit the proposed material for such examination and test; and such tests shall be made in the presence of the said examiners. or a majority thereof, according to such or a majority inervol. according to such rules and specifications. All expenses of such examiners and such examinations and tests, shall be paid by the applicant, and said examiners may require security therefor.

(b) The said examiners shall within 30 (b) The said examiners shall within and average after such examination and tests, certify the results of such test, and their decision on the said application to the Commissioner of Buildings, who shall in the event of the examination and tests being satisfactory, authorize the use of such manifests. terial or construction as fireproof material.

A complete record of the proceedings and all acts and decisions of the said Board of Fyaminers shall be kept by the Commis-

sioner of Buildings in his office.

(a) The Commissioner of Buildings shall have the power to pass upon any question relative to the mode or manner of construc-tion or materials to be used for fireproofing in the erection or alteration of any building or structure to make the same conform to the true intent and meaning of the several provisions of this Chapter.

- \*622. Incombustible Material.) The following materials shall be considered as incombust'bly materials. I metal or fire-resisting glass not less than one-quarter of an inch in thickness, metal. than one-quoter et an inch in tutckness, metal, flostering on metal lath and metal-studding pluster blocks stone, granite, marble, approved cinder concrete, or one of the fireproof materials discribed in this chapter \*Amended February 20, 1911.
- 623. Walls—Enclosing in Buildings of Steel Skeleton Construction.) If buildings are made of fireproof construction, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall not be less than twelve inches in thickness; provided, such walls shall be thoroughly anchored to the iron skeleton, and whenever the weight of such walls rests upon beams or columns, such beams or upon beams or columns, such beams or columns shall be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the

walls below them. All walls shall be of fireproof or incombustible material.

624. Columns—Exterior.) (a) All iron or steel used as vertical supporting memof the external construction of any building exceeding fifty feet in height shall building exceeding fifty feet in height shall be protected against the effects of external change of temperature, and of fire by a covering of fireproof material consisting of at least four inches of brick, hollow terra cotta concrete, burnt clay tiles, or of a combination of any two of these materials, provided that their combined thickness is not less than four inches. The distance of the extreme projection of the metal, where such metal projects beyond the face of the column, shall be not less than two inches from the face of the fireproofing; provided, that the inner side of exterior columns shall be fireproofed as hereafter required for interior columns.

(b) Where stone or other incombustible material not of the type defined in this ordinance as fireproof material is used for the exterior facing of a building, the distance between the back of the facing and extreme projection of the metal of the column proper shall be at least two inches, and the intervening space shall be filled

and the intervening space shall be filled with one of the fireproof materials.

(c) In all cases, the brick, burnt clay, tile or terra cotta, if used as a fireproof covering, shall be bedded in cement mortar close up to the iron or steel members, and all joints shall be made full and solid.

625. Columns—Interior.) (a) Covering of interior columns shall consist of one or more of the fireproof materials herein

described.

(b) If such covering is of brick it shall be not less than four inches thick; if of concrete, not less than three inches thick; concrete, not less than three inches thick; if of burnt clay tile, such covering shall be in two consecutive layers, each not less than two inches thick, each having one air space of not less than one-half inch, and in no such burnt clay tile shall the burnt clay be less than five-eighths of an inch thick; or if of porous clay solid tiles, it shall consist of at least two consecutive layers, each not less than two inches thick; or if constituted of a combination of any two of these materials, one-half of the or a constituted of a combination of any two of these materials, one-half of the total thickness required for each of the materials shall be applied, provided that if concrete is used for such layer it shall not be loss then they include:

be less than two inches thick.

(c) In the case of columns having an "H" shaped cross section or of columns having any other cross section with channels naving any other cross section with channels or chases open from base plates to cap plates on one or more sides of the columns, then the thickness of the fireproof covering may be reduced to two and one-half inches, measuring in the direction in which the flange or flanges project, and provided that the thin edge in the projecting flange or arms of the cross sections does not exceed three-markers of an inch in thickness. The thickquarters of an inch in thickness. The thickness of the fireproof covering on all surfaces measuring more than three-quarters of an inch wide and measuring in a direction proportion to the content of th or an men wide and measuring in a direction perpendicular to such surfaces shall be not less than that specified for interior columns in the beginning of this section, and all spaces, including channels or chases between the fireproof covering and the metal of the columns, shall be filled solid with fireproof material. Lattice or other open columns shall be completely filled with approved cement concepts. proved cement concrete.

626. Columns—Wiring Clay Tile On.)
(a) Burnt clay tile column covering shall be secured by winding wire around the columns after the tile has all been set around such columns. The wire shall be around such columns. The wire shall be securely wound around tile in such manner that every tile is crossed at least once by a wire. If iron or steel wire is used it shall

be galvanized and no wire used shall be less

than number twelve gauge.
(b) In places where the In places where there is trucking or wheeling, or handling of packages of any kind, the lower five feet of every column with hollow tile shall be incased in a pro-tective covering of No. 16 U. S. gauge steel embedded in concrete.

embedded in concrete.

\*627. Concrete—Approved Cement—When
Fireproof.) (a) All approved cement concrete shall consist of a standard Portland
cement, torpedo sand, and crushed stone or
gravel, or crushed blast furnace slag, or
crushed burnt clay, the volumetric quantity
of any one of these materials in addition to
the torpedo sand shall not exceed eight
times the volume of the Portland cement.
All of the ingredients of cement concrete
whall be thoroughly worked and wet so as shall be thoroughly worked and wet so as to cover each piece of stone or gravel or slag or burnt clay with moistened cement; and the cement and sand shall fill the voids between the coarse material of the cement concrete

(b) Coment concrete to be considered a fire-froof material shall comply with the provisions of Section 561 and shall be cast and worked in an unset condition against the metal. In all cases where cinder concrete is used, the metal shall be protected as required by Section 568 of

\*Amended February 20, 1911,

628. Concrete Ingredients.) (a) below the concrete ingredients,) (a) The separate ingredients of concrete shall be measured for each batch, and shall be thoroughly mixed and must be uniform in color, appearance and consistency before placing. The concrete shall be worked continuously with suitable tools, as it is put in

tinnously with suitable tools, as it is put in place, filling the forms completely.

(b) The sand to be used for concrete shall be clean coarse sand, free from loam or dirt. If crushed stone grit is used it shall be clean, gritty, and free from dust.

(c) The stone to be used in concrete the concrete shall be clean, gritty, and free from dust.

shall be clean crushed hard stone, or clean crushed blast furnace slag, or gravel, and of a size to pass through a 1½-inch square mesh. If limestone or slag is used, it shall be screened to remove all dust; if gravel is used, it shall be thoroughly washed. Stone shall be drenched immediately before using.

(d) In all cases, the brick or hollow tile, solid or terra cotta shall be bedded in cement mortar close up to the iron or steel member and all joints shall be made full

and solid.

629. Pipes Enclosed by Covering.) (a) Pipes shall not be enclosed in the fireproofing of columns or in the fireproofing of other structural members of any fireproof building; provided, however, gas or electric light conduits not exceeding one inch diameter may be inserted in the outer three-fourths inch of the fireproofing of such structural member, where such fireproofing is entirely composed of concrete.

(b) Pipes or conduits may rest upon the tops of the steel floor beams or girders, provided they are imbedded in cinder concrete to which slaked lime equal to five per cent of the volume of concrete has been added before mixing or their being imbedded

in stone concrete.

630. Shafts-Doors-Frames-Enclosure.) (a) In cases where a pipe, conduit, dumb waiter, cable wire, conveyor, belt, or any combination thereof, passes from one story to another story through an open hatch or floor opening, a shaft or enclosure of fire-proof material shall be built from floor to floor around such hatch or floor opening in each story above and below such hatch or floor opening in the same manner as described for fireproof partitions in this chapter, and no wood shall be used in the con-struction, support or fittings of such shaft. The area of space thus enclosed shall not exceed the area of the floor opening by more than one hundred per centum,

(b) All burnt clay or terra cotta partitions or walls around such shafts shall be plastered on the outside and plastered or

pointed on the inside.

(e) All doors, frames, sashes. and windows in partitions or walls around such floor openings, shall be built of incombustible material. The supports of such doors, frames, sashes, casings and windows shall also be of incombustible material. In the case of doors, such supports shall be of rolled structural metal extending from floor Where there to ceiling and secured to both. are brick walls of twelve inches or more in thickness, the supports need not extend to ceiling as above specified. All glass used in connection with such partitlons or walls shall be wired glass.

Such fireproof (a) enclosures may omitted if all of the space in each floor opening not occupied by pipes, conduits, cables, wires, or any combination thereof, are filled in solid fireproof material not less

than eight inches thick.
631. Spandrel Beams, Girders, Lintel.)
The metal of the exterior side of the spandrel beams or spandrel girders of exterior walls, or lintels of exterior walls, which support a part of exterior walls, shall be covered in the same manner, and with the same material as specified for the exterior columns in this chapter: provided, however, that shelf angles connected to girders by brackets or projections of girder flanges not figured as part of the flange section, come within two inches of the face of the orick or other covering of such spandrel beams, girders or lintels. The covering thickness shall be measured from the extreme projection of the metal in every case.

632. Eeams, Girders and Trusses—Coverings of.) (a) The metal beams, girders and trusses of the interior structural parts of a building shall be covered by one of the fireproof materials hereinbefore specified so applied as to be supported entirely by appared as to be supported entirely by the beam or girder protected, and shall be held in place by the support of the flanges of such beams or girders and by the cement mortar used in setting.

(b) If the covering is of brick, it shall

(b) If the covering is of brick, it shall not less than four inches thick; if of hollow tiles or if of solid porous tiles, or if of terra cotta, such tiles shall be not less than two inches thick, applied to the metal in a bed of cement mortar; hollow tiles shall be constructed in such a manner that there shall be one air space of at least three-fourths of an inch by the width of the metal surface to be covered within such clay coverings; the minimum thickness of concrete on the bottom and sides of metal shall be two inches.

(c) The top of all beams, girders, and trusses, shall be protected with not less than two inches of concrete or one inch of burnt clay bedded solid on the metal in

cement mortar.

In all eases of beams, girders or trusses, in roofs or floors, the protection of the bottom flanges of the beams and girders and so much of the web of the same as is not covered by the arches shall be made as hereinbefore specified for the covering beams and girders. In every case the thick-ness of the covering shall be measured from the extreme projection of the metal, and the entire space or spaces between the covering metal shall be filled solid with one and the of the fireproof materials, excepting the air spaces in hollow tile.

Provided, however, that all girders er trusses when supporting loads from more than one story shall be fireproofed with two thicknesses of fireproof material or a combination of two fireproof materials as required for exterior columns in Section 625 of this chapter, and each covering of fireproof material shall be bedded solid in ce-

ment mortar.

633. Fireproofing of Exterior Sides of Mullions.) In buildings required by this chapter to be of fireproof construction on exposures where metal frames, doors, sash and wired glass are not required, all vertical door or window mullions over eight inches wide shall be faced with incombustible material, and horizontal transom bars over six inches wide shall be faced with a fireproof or with an incombustible material.

634. Fireproof Covering, Independent.)
The fireproof covering of brick, concrete, burnt clay tiles, hollow terra cotta or of a combination of any two of these materials shall be applied to all of the structural members of the exterior of a fireproof building previous to and independent of the application of the architectural facing of fireproof building with an incombustible or fireproof material.

of.) Walls, Support and Fireprooning of.) Where skeleton construction is used for the whole or part of a building the enveloping material and the walls shall be supported on the skeleton Support and Fireproofing independently supported on the skeleton frame for each individual story.

636. Iron or Steel Plates for Support of Wall.) Where iron or steel plates or angles are used in each story for the support of the facings of the walls of such story, such plates or angles shall be of sufficient strength to carry the weight within the limits of fibre stress for iron and steel elsewhere specified in this chapter of the enveloping material for such story, and such plates or angles may extend to within two inches of the exterior of such covering.

637. Cut-out Boxes, Chases, Etc.—Fire-proof Covering.) No electric service cut-out box, switch box, cabinet, chase or any other recess, shall encroach on the mini-mum thickness required for any fireproof covering on structural metal, except as provided in this chapter. If the depth of any cut-out box, switch box, cabinet, or chase. or if any other recess is to be concealed, or partially concealed, then the thickness of the fireproof covering shall be increased correspondingly.

638. **Segmental and Flat Arches.)** (a) Segmental arches shall have a rise of at least one inch for each foot of span of arch.

The least thickness of a hollow tile or porous terra cotta segmental arch shall be one-half of an inch per foot of span, but no such hollow tile or terra cotta arch shall be of a thickness less than five inches.

(c) Both flat and segmental arches shall be so constructed that the joints of the same radiate from a common center and there shall be a cross rib for every four inches, or fractional part thereof, in height in each tile block. The skewback of the arches shall the carefully fitted to the beams supporting them, and, in addition to the cross ribs, there shall be additional diagonal re-enforcing ribs in the skewback. Such arches, whether flat or curved, shall have their beds well filled with cement mortar, and the centers shall not be struck until the mortar has set.

(d) Burnt clay skewbacks shall be molded in such a manner as to support the burnt clay covering on the under sides of beams

or girders.
639. Fireproof Floor and Roof Construction.) Brick, hollow tile, porous terra cotta. or approved cement concrete, or approved cinder concrete, shall be used for the construction of floor and roofs of fireproof buildings. Flat arch hollow tile, or flat arch porous clay tile floor arches shall have a height of at least one and one-half inches for each foot of span.

640. Wood Flooring and Nailing Strips.)

O Wood flooring and wooden nailing strips for such flooring may be used in fire-proof buildings.

(b) Where such flooring is used in a fireproof building, the space immediately under the flooring, and between the nailing strips and under such nailing strips, shall be filled with a cement or a cinder concrete tamped into place in an unset state, or with such other incombustible material as shall be approved by the Commissioner of Buildings.

Partitions in Fireproof Buildings.) (a) Where stairs, shafts and elevators are enclosed they shall be enclosed in fire-proof partitions, as described in Section 642 of this chapter; all other partitions, shall be incombustible partitions. Where blocks are used for building partitions or as enclosing walls, the joints shall be well

filled with mortar.
(b) The partition The partitions shall be wedged tight between floor and ceilings with incombus-

tible wedges.
642. Partitions — Fireproof — Incombustible.) (a) Only fireproof material shall be used for fireproof partitions; if of brick, they shall be not less than four inches thick, and if of partition blocks, not less than three inches thick. If fireproof partitions are of reinforced concrete they shall be not less

than three inches thick.
(b) All fireproof partitions required by this ordinance shall be supported directly

(b) All fireproof partitions required by this ordinance shall be supported directly on the steel construction, or on the fireproof floor arches, or on concrete, or on brick.

(c) Only fireproof or incombustible material shall be used in the construction of partitions not required to be fireproof, excepting that foregreeings deep each exception. cepting that frames, casings, doors, sash and the rough carpenter work required for the proper fastenings of such frames, casings, doors or sash, may be of wood, and that ordinary glass may be used in doors and partition windows

(d) All corridor partitions of incombustible or fireproof material in fireproof buildings, shall be supported directly on the steel construction, on the fireproof floor

steel construction, on the fireproof floor arches, on concrete or on brick.
643. Stairs—Landings.) (a) Stairs in fireproof buildings shall be built of approved cement concrete, reinforced concrete, stone or metal, or a combination of one or more such materials.

(b) The handrails of such stairways may

be of wood.

(c) If stairs are constructed of solid stone or plain concrete, having the tread and in one piece, then there shall be not less than sixty square inches of stone or concrete in the cross section of such combined tread and riser.

(d) If stone treads have less than sixty inches of cross section and platforms less than seven inches in thickness are used, they shall have a metal sub-tread and sub-platform three thirty-seconds of an inch

thick.

If platforms have a floor arch subconstruction as described in Sections 638 and 639 of this chapter, then the metal sub-

omitted.

platform may be omitted. 644. Roofs—Rise of Roof Above Limit of **Height.)** In the case of buildings which are fireproof in their construction, the roof may In the case of buildings which are rise above the limit of height of wall fixed by this chapter for such buildings at a slope not to exceed thirty degrees with the horizon, and to a height not exceeding twenty feet above such limitation of the height of the wall. The space enclosed by such roof above the limitation of the height of such wall may be used as an inclosure for pipes, ventilating or elevator machinery or for ven-tilating ducts, but it shall not be lawful to use such space for purposes of storage, business or residence. 645. Sheet Mc

645. Sheet Metal Work—Support Of.)
Wood shall not be used as the support of
any sheet metal work or of any gutter or
cornice of a building more than ninety feet

in height.

### ARTICLE XIV.

Slow Burning Construction.

646. Slow-Burning Construction Defined.) The term "Slow-Burning Construction" shall apply to all buildings in which the structural members, other than walls elsewhere required to be of masonry, which carry the loads and strains which come upon the floor and roofs thereof are made wholly or in part of combustible material, but throughten the strain of the out which the structural metallic members, if used, shall be protected against injury from fire by coverings of fireproof material. The lower five feet of metal columns shall be protected as required in Section 634 of this charter. Underside of injers shall be be protected as required in Section 634 of this chapter. Underside of joists shall be protected by a covering of three coats of plaster laid on metal lath; and a layer of mortar or other incombustible material at least one and one-half inches thick shall be applied on all floors and roof surfaces above the joists of the same.

\*647. Posts, Girders and Partitions.) Wood posts, if used, shall be of not less than one hundred square inches sectional area. Wood girdnumerea square inches sectional area. It ood gird-ers, if used, shall be of not less than secunity-two square inches sectional area. All partitions in buildings of this type shall be made entirely of incombustible material. Wood furring, wood studs and wood loth shall not be permitted in buildings of this type.

\*Amended February 20, 1911.

Stairs, Construction of.) buildings are required to be of "slow burning" construction, all stairs in such building shall be of incombustible material, except as hereinafter provided. Said stairs may be of ordinary construction, if said building is equipped with an automatic sprinkler system, and stairs are euclosed in a fireproof

# ARTICLE XV.

Mill Construction.

649. Definition-Mill Construction Requirements.) The term "Mill Construction" shall apply to all buildings in which wooden posts, if used. have a sectional area of not less than one hundred square inches, and wooden girders and joists a sectional area of not less than seventy-two square inches, and roofs, if of wood, a thickness of not less than two and five-eighths inches in a single layer, and floors, if of wood, a thickness of not less than three and one-half inches in not more than two layers, the lower one of which shall be not less than two and five-eights inches in thickness, and in which all structural metallic members, and m which all structural metallic members, if used, are fireproofed as required for fireproof construction, and in which all floors and roofs not constructed as above are of fireproof construction as elsewhere required for fire-proof construction in this conditions. proof construction in this ordinance.

\*650. **Fireproofing.)** (a) Partitions in buildings of mill construction shall be made entirely of incombustible material. If iron columns, girders, or beams are used in buildings of this they shall be protected as specified in this Chapter; but the wooden posts, girders and joists need not be protected by firefroof covering. Wood furring, wood studs and wood lath shall not be permitted in buildings of this type. \*Amended February 20, 1911.

Amended representaty 20, 1811.

(b) If reinforced cinder concrete construction is used in the structural parts of a building which is required to be of slow-burning or mill construction by this chapter, then all partitions shall be of incombustible material and all parts other than structural parts and partitions of the building shall be as required for slow-burning or mill construction buildings by this ing or mill construction buildings by this chapter.

651. Stair Construction Where Automatic Sprinkler System is Installed.) In buildings required to be of "mill construction, all stairs in such buildings shall be of "incombustible" material, except as hereinafter provided. Said stairs may be of wood con-struction if said building is equipped with an automatic sprinkler system and stairs are enclosed in a fireproof wall.

# ARTICLE XVI.

#### Ordinary Construction.

652. Ordinary Construction Defined.) The term "ordinary construction" as used in this chapter, means the ordinary system of construction in which timber and iron struction in which timber and iron structure. tural parts are not protected with fire-resisting coverings and in which the walls are of masonry built as required by this chapter.

#### ARTICLE XVII.

#### Frame Buildings.

653. Repairing of Frame Buildings Within Fire Limits.) Frame buildings within the fire limits which have been damaged by fire, decay or otherwise, to an extent not greater than fifty per cent of their value may be repaired, provided there is no in-crease in size of such buildings over their original dimensions, and, provided that incombustible roof covering required by Section 596 is used. And provided, further, that where any frame building is raised for the purpose of erecting a basement story under the same, the walls enclosing such basement shall be of masonry.

\*654. Frame Buildings Prohibited—Excepons.) (a) Hereafter no frame building hall be erected, nor any frame addition tions.) made to any existing frame building, within the fire limits of the city, except where ex-press provision is made in this chapter there-

- Outside the fire limits it shall be lawful to erect frame buildings not exceed-ing forty feet in height from the sidewalk to the highest point of roof. If such frame buildings have a basement story of masonry, their height above the sidewalk may be made not to exceed forty-five feet. Provided, however, that in no case shall any portion of any frame building above the second floor be used as a separate living apartment.
- (c) It shall be lateful to surround frame buildings with a veneer of brick not less than four inches in thickness, provided the stid brick is not earried higher than the second story, or twenty-two feet above the basement criting; and provided further that the sid sement criting; and provided for the that the sid sement criting that the the further that the soid veneer is anchored to the studding or other frame construct on in a manner satisfactory to the Commissioner of Buildings. Such brick vencer is not to be placed on gables or any when conver is not to be placed on gables or any other parts of frame buildings above the height berein specified. All frame buildings which it is desired to surround with brick veneer must have their basement walls and foundations of solid masonry, as provided in Section 658 of The Chicago Code of 1911.
- \*Amended March 19, 1912, by adding C(c). 655. Frame Buildings Within the Fire Limits Changed Into Flat Buildings—Fire Walls.) Whenever any frame building within the fire limits shall be remodeled, aftered or changed for the purpose of using the same for flats or apartments, or whenever such frame building shall be occupied for flat or apartment purposes, each suite of apartments in such building shall be sep-arated from every other suite of apartments in such building by a wall of incombustible material, of such dimensions and thickness as required by this chapter.
- 656. Frame Buildings-Raising-Requirements-Changing Gable or Hip Roofs to Flat Roofs.) Permission may be granted by the Commissioner of Buildings for the raising of existing frame buildings, whether within or without the fire limits, to the limits of height hereinbefore fixed for new frame buildings, and no more, and inside the fire

limits for the purpose of putting a masonry basement thereunder. The Commissioner of Buildings is also authorized to issue permits for changing gable or hip roofs of existing frame buildings to flat roofs, and for the raising of walls incident to such change. But if such hip or gable roof is changed to a flat roof and the walls raised in connection with such change, the total cubic contents included by the walls so raised and the roofs so altered shall not exceed the cubic contents originally included in such gable or hip roof, and in no case shall a two-story and attic building be converted into a threestory building thereby.

657. Frame form Height.) 657. Frame Buildings Carried to a Uniform Height.) Where the different parts of a frame building inside the fire limits are of different heights a one-story portion may be raised to the height of two stories. provided the greatest height thereof does not exceed the limits of height prescribed in this chapter for frame buildings, and provided, that no room in the existing building or in the addition thereto shall violate the requirements of this chapter for habitable rooms.

\*658. Basement or Story Placed Beneath Frame Buildings.) A frame building may be raised for the purpose of erecting a basement or story, or both, thereunder, but the principal floor of such frame building shall principal floor of such frame building shall not be raised to a higher level than 16 feet above the grade of the sidewalk upon which such premises abut. Where a building so raised one story in height only and the same is raised so as to permit a basement under the same not to exceed six feet six inches in height from the basement floor to the ceiling of said basement, the said house may be placed when cedar posts. In all other cases the walls evelosing such basement or story shall be of masonry and not ress than 12 inches thick except where a one-story frame building is raised and has a basement only built thereunder, the maone-story traine principles that the ma-sonry walls of such basement may be eight sonry walls of such basement may inches thick above and and sonry walls of such basement may be eight inches thick above grade and 12 inches thick below. The foundation of such wall shall be constructed as provided in this chapter; provided, however, that no frame building shall be raised for the purpose of constructing a basement or story, or both, under the same to a greater height to the ten of its roof than that elsewhere herein given as the maximum height above grade given as the maximum height above grade for frame buillings. The thickness of walls hereinbefore required shall also brick walls in new frame buildings, \*Amended July \$, 1912. also apply

\*659. Chimneys in Frame Buildings—Chimney Flues Through Partitions.) (a) Chimneys m frame buildings shall be built Section 581 of this chapter. The ult as remired by The wood framing of frame buildings shall be trimmed around chimneys in such a manner manner as not to come within

(b) Metal smoke pipes or tile flues shall not extend through the floors or through the ceiling or roof of any building; and where such smoke pipes or tile flues pass through partitions the woodwork of such partitions shall be protected by a sheet metal ventilated tin thimble at least twelve inches greater in diameter than the diameter of the flue.

\*Amended February 20, 1911.

Lot Lines-Requirements as Number—Dimensions.) Number—Dimensions.) Frame buildings, excepting sheds not exceeding three hundred square feet in area shall not be built nearer than one foot to any line of the lot upon which they are built, street and alley lines excepted, except as hereinafter pro-vided. It shall not be lawful to erect a frame building wider than forty feet nor deeper than seventy feet, unless such build-ing be divided by a fire wall or fire walls, built of incombustible material and of a thickness of not less than four inches and

of construction to be approved by the Commissioner of Buildings, so that no more than two thousand eight hundred square feet of superficial area shall be contained unany section or part of such building, uninclosed by such fire wall, and if openings are shall be built of brick not less than eight inches thick, and such openings shall have doors as described in Section 573. Each section of such buildings shall be regarded as a separate building for the purpose of described in Section of such building to the purpose of describing the number and construction of termining the number and construction of its stairways and means of egress. If more than one frame building is built in the direction of the depth of any one lot, such buildings shall not be built with a less distance than ten feet between them, except where both buildings are used for living purposes, and in that case the distance shall be governed by Sections 439 and 440 of this

\*661. \*661. Sheds—Open Shelter—Height of Walls and Foundations—Enclosed.) (a) Except as hereinafter provided, open shelter sheds not exceeding eight hundred square teet in area not exceeding fourteen feet in height from the ground may be erected within the fire limits, provided they have roofing of incombustible material and the highest point is not over fifteen feet above the ground, and provided that the roofs be supported on sufficient posts or piers; provided, however, that such sheds may be built with an area not to exceed sixteen hundred square feet, if they are kept at least twenty-five feet from any lot line and any other building or structure. Such sheds shall have no combustible enclosing walls or wooden floors, except that a floor of two-inch planking laid directly upon the ground may be used. sheds shall only be erected upon the rear of the lot, and not more than one such shelter shed or any other shed shall be erected on

ny lot of twenty-five feet in width.

(d) Sheds not exceeding fourteen feet in height from the ground to the highest point thereof, and not exceeding three hundred square thereof, and not exceeding three hundred square feet in area, with an incombinstable roof, may be constructed of wood within the fire limits. Such sheds shall not be located on the front part of any lot, nor shall they be used as a dwelling or as an addition to a dwelling house, or for any business purpose whatever, nor shall more than one shed be erected on any one build-ing lot of twenty-five feet in width.

(b) If it is desired to enclose an open shelter shed, the enclosing walls shall be the enclosing walls shall made of brick, hollow tile, or other incom-bustible material, and such walls shall have foundations extending to solid ground and at least four feet below the surface of ground.

Open shelter sheds may be erected (c) (c) Open shelter sheds may be erected outside the fire limits not to exceed twenty-eight hundred square feet in area and subject to the approval of the Commissioner of Buildings: provided, however, that shelter sheds which comply in other respects with the requirements of this section, may be built not to exceed nine thousand square feet in area where such sheds are leasted at feet in area where such sheds are located at least twenty feet distant from any other structure and from any lot line.

\*Amended, and Par. (d) (new) added February 20, 1911.

662. Sheds—Ccal, Brick, Stone, Cement and Salt Sheds and Sheds for Icing Cars Along Railroad Tracks and Navigable Streams.) Open shelter sheds to be used for the storage or handling of coal, brick, stone, cement, salt or such commodities which are incombustible, or for the icing of cars, may be erected within or without the fire limits upon, along or adjacent to steam railroad tracks, or along or adjacent to navigable waters; provided, such sheds shall have incombustible roofing and shall not ex-

ceed 35 feet in height from the ground to ceed 35 feet in height from the ground to the highest point of the roof; provided, further, that said sheds shall be located at least 25 feet distant from any other structure and from any side lot line. If it is desired or intended to enclose any such sheds, the enclosing walls shall be of incombustible material. No such shed shall be built upon any lot or parcel of ground fronting upon any street within 75 feet of any building used exclusively for residence purposes, unless the consent of the owners of the majority of the frontage on both sides of such street between the two nearest intersecting cross streets shall first have been tersecting cross streets shall first have been obtained by the person, firm or corporation desiring to erect and maintain such shed, and said written consents shall be filed with the Commissioner of Buildings before a permit shall be issued for such shed.

\*663. Ice Houses.) (a) Houses within the fire limits to be used exclusively for the storage of ice, not exceeding forty-five feet in height, and of a floor area not exceeding 9,000 square feet, may be constructed of wood with incombinstible roofing, the walls to be enclosed with an enroohing, the walls to be encoused with an en-celope of incombustible material; eight-inch walls of brick or tile or approved coment concrete with proper foundations of masonry shall be used tor such envelopes.

\*Amended February 20, 1911.

(b) Houses to be used exclusively for the storage of ice. located outside of the fire limits and contiguous to any lake and six hundred teet from any other building, except buildings used in connection with the conduct of said business, may be constructed of frame with incombustible roofing, and the floor area of any such building shall not exceed eighty thousand square feet, unless the building is divided by a solid wall of masonry for each additional 80,000 square feet of floor area, or fractional part thereof; and shall extend at each end not less than one foot beyond the enclosure of said building and such wall shall be subject to the

approval of the Commissioner of Buildings.

(c) Houses to be used exclusively for the storage of ice, located outside of the fire limits, and contiguous to railroad tracks and not within one hundred feet of any other building, may be constructed of frame with incombustible roofing, and the floor area of any such building shall not exceed 29,000, square feet unless the building is divided by a solid wall of masonry for each additional 20,000 square feet of floor area or frac-tional part thereof; said wall shall extend at least one foot beyond the enclosure of said building on each end and shall be approved by the Department of Buildings.

(d) All dividing walls must extend through and above the roof of any building in which they are built to a distance of three feet and must be covered with incombusti-ble coping. No dividing wall shall be of less thickness than twelve inches at any

point thereof.

\*664. Lumber Yards—Not to be Located Near Residence Except by Consent.) No person or corporation shall establish, mainperson or corporation snail establish, maintain, conduct or operate within the fire limits of the city as the same are now or may hereafter be defined by ordinance, any lumber yard or place where new or second hand lumber is kept for sale or is stored for seasoning or drying on any premises fronting on any street in any block where two-thirds of the huildings on any street surrounding of the buildings on any street surrounding any such block are used exclusively for residence purposes, unless the written consent of the owners of a majority of the frontage on both sides of all the streets surrounding the block in which it is proposed to locate, establish, conduct or maintain such lumber yard or place, be first obtained by the person or corporation desiring to establish, maintain or operate such lumber yard or place, consenting to the issuance of a permit from the Department of Buildings, and also consenting that a license for the establishment, keeping or maintenance of such lumber yard or place shall be issued by the city. Such written consent shall accompany the application for a license and building permit made by such person or corporation.

\*Amended May 6, 1912.

665. Storage of Lumber Near Planing Mill or Private Residence, Tenement House or Hotel.) No lumber shall be piled for the purpose of storing, seasoning or drying the same, within fifty feet of any planing mill or wood working manufactory, nor within one hundred feet of any private residence, tenement house or hotel, unless the same has been erected since the establishment of such vard. such vard.

#### ARTICLE XVIII,

#### Stairways.

666 Stairways, Number—Location—Conton.) (a) Fireproof office buildings struction.) (a) Fireproof office buildings existing at the time of the passage of this ordinance which are equipped either with one stairway and two or more stairway fire escapes or with two stairways and one or more stairway hre escapes, shall not be required to have additional stairways or stairway fire escapes.

(b) Except as otherwise expressly pro vided in this Article, it shall be unlawful to construct or maintain any building or structure of Classes I, II and VII unless its stairway or stairways comply with the

following provisions:

(c) In every existing building of ordinary construction having an area greater than 9,000 square feet or of mill or slow-burning construction greater than 12,000 square feet, there shall be not less than three stairways. The width of stairs shall be at least eighty per cent of the width of stairs as computed by the formulæ given herein and in no case less than twelve feet.

(d) Every building shall have at least one stairway from the ground to the top floor and one stairway from the lowest basement or cellar to the street grade, and no stairway shall be less than three feet in

width.

(e) width of stairs required for a building shall be constructed as the total width of all stairways required on the building. Stairs shall be measured between the wall and handrail for a single stair and between handrails where two or more hand-

rails are required by this chapter.

(f) In buildings of Class I and Class IIa the width of stairs and fire escapes required for a building shall be determined by the floor area measured on the third floor of the building and such area shall not include walls, columns, stairs, elevator shafts, well holes, chimneys and corridors. In all cases where the building is less than three stories in height the width of stairs shall be determined by the floor area of the second floor as hereinafter specified.

\*667. Stairs—Number and Width of in Classes I, II and VII.) (a) In buildings of Class IIb, Class IIe and Class VII the number and width of the stairs and fire escapes shall be determined by the area of that portion of the third floor not occupied by walls, columns, stairs, elevator shafts and wellholes.

In buildings of Class I, II and VII the number and width of stairs required shall

be as follows:

(b) IN ORDINARY CONSTRUCTION.

With floor area of 5,000 square feet or less, two stairways;

With floor area of 5,000 to 9,000 square feet, three stairways.

\*Provided, however, that in buildings of ordinary construction, existing from to December 5, 1910, with floor area of 5,000 square feet or less, one starway only shall be required where the building s also equipped with an outside stairway fire escape, and in all such buildings with floor area of from 5,000 to 9,000 square feet, two stairways only shall be required; provided such building is also equipped with an outside starway fire escape.

\*Amended July 22, 1912.

(c) The width of stairs required in buildings of ordinary construction shall be com-

puted as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in square feet and multiplying the remainder by twelve and dividing the product by 1,000 and adding 72 inches to the quotient, expressed in the formula as follows:

(area-3000) times 12

72 inches plus -1.000

(d) IN MILL OR SLOW-BURNING CONSTRUCTION.

With floor area of 6,000 square feet or two stairways.

With floor area of 6,000 to 12,000 square feet, three stairways.
(e) The width o

feet, three stairways.

(e) The width of stairs required in buildings of mill or slow-burning construction shall be computed as follows:
The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in feet and multiplying the remainder by eight and dividing the product by 1,000, and add-ing 72 inches to the quotient; expressed in the formula as follows:

#### (area-3,000) times 8 72 inches plus -

(f) In Fireproof Construction.

With floor area of 7,000 square feet or less, two stairways.

With floor area of 7,000 to 15,000 square three stairways.

feet, three stairways.
With floor area of 15,000 to 21,000 square four stairways.

With floor area of 21,000 square feet and

over, five stairways.

cver, nve stairways.

(g) Provided, however, that in fireproof buildings having an area of 21,000 square feet or more only four stairways shall be required if such building is completely equipped with an approved automatic sprinkler system.

The width of stairs required in build-(h) ings of fireproof construction shall be computed as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3.000 from the floor area of the building in feet and multiplying the remainder by six and dividing the product by 1,000, and add-ing 72 inches to the quotient; expressed in the formula as follows:

(area-3,000) times 6

#### 72 inches plus -1.000

(i) Provided, however, that where buildings of Class I are of fireproof construction and are used solely for storage warehouse purposes and the number of persons employed on any one floor does not exceed the number specified hereafter in this section they shall comply as to number of stairways as follows:

With floor area less than 8,000 square feet where not more than ten persons are employed on a floor, two stairways.

With floor area greater than 8,000 square feet and less than 15,000 square feet where not more than fifteen persons are employed on a floor, three stairways.

With floor area greater than 15,000 square feet where not more than twenty persons are employed on a floor, four stairways.

The width of stairs shall be com-

puted as tollows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in feet and mustiplying the remainder by four and dividing the product by 1,000, and addmg 72 menes to the quotient; expressed in the formula as follows:

(area-3,000) times 4 72 inches plus -1000

\*668. Stairs—Other Requirements.) (a) The width of stairway fire escapes and threequarters of the width of sliding fire escapes required by this chapter may be deducted

from the width of stairs required.

(b) Stairways shall be located as far from each other as practicable. The bottom of each stairway shall be in the immetom of each stairway shall be in the immediate vicinity of the top of the stairs leading to the next lower story and the line of travel from stairway to stairway shall be direct and easily accessible each to the other. At least one stairway shall extend to the roof of every building. In Classes I, II and VII, the whole number of stairways required for each building shall be complete in every respect true the first to complete in every respect from the first to the topmost story.

(c) Every story below the street grade shall have not less than two stairways to the first story and each such stairway shall be not less than three feet wide, but where a basement or cellar is used for the retail sale of goods the stairway from such basement or cellar shall in number and aggregate width comply with the requirement of this section for the first four stories above side-

walk grade.

- walk grade.

  (d) Where two areas of the same building adjoin and are separated by fireproof dividing walls they may have a stairway in common, provided such stairway is not less than five feet wide and is inclosed in all stories of the building by fireproof walls in non-fireproof buildings and by fireproof partitions in fireproof buildings; and where partitions in fireproof buildings; and where the stairways and landings are built as required by this chapter for buildings of fireproof construction, and where the doors, trames, sashes and casings, and the glazed portion thereof are built as described in Sections 572 and 573 then in such case such stairway may be considered as equivalent to one open stairway from each such area, and where such stairway provides exit from only one floor area such stairway may be considered as equivalent to two open stairways but in no case shall there be less than two stairways in any such building except as otherwise provided in this chapter.
- (e) Where adjoining buildings or buildings on opposite sides of an alley or other open space, and of the same class, used by the same person, firm or corporation, are connected by freproof bridges or passessing with the proof doors at each and or by fireproof doors at each end, or by fireproof doors on each floor built and equipped as required by this chapter for dividing wall doors if such bridge or pas-sageway or fireproof door is located as far sageway of interior door is beated as Interior as as practicable from the stairways in both said buildings, then said bridge or passageway or fireproof door may be considered to be equivalent to a stairway for each of the two areas.
- (f) In buildings of classes I, II and VII, where an interior stair-roay is enclosed in a tower and built as required by the provisions of Section 660 paragraph (n) of this Chapter, then such stairway shall be considered the equivalent of two star-ways, or a stair-way and a five-escape; provided, however, that if such stair-way is considered the equivalent of two stair-ways the building must be equipped with a stair-way fire-escape, or fire-escapes, as is required by this Chapter.
  - \*Amended December 4, 1911,

- (g) Exterior stairways in buildings of Class 1, 11 and vii bunt entirely of steel and iron, having ice-proof treads not less than ten inches wide from hosing to riser and a riser of eight menes or less for each riser, and otherwise made as required for starrway lire escapes in this chapter and where such starrway lire escapes this chapter and where such starrway lire escape extends from the inside grade to the top floor of the building or is supplied from the second floor to the ground with a counterbalanced section and has a steel ladder from the top landing to the root, then such stairway may be considered the equivalent of one interior stairway and one stairway fire escape if the width of such stairway and that of the one or more stairways in the building equals the width of stairs required by this chapter; provided, that in such case the respective moors, door sills, and stairway platforms are flush, and that the doors do not ob-struct the stairs or platforms and that the struct the stairs of platforms and that the doors are each at least 50 per cent of the width of said stairway and that the windows, doors and frames passed by such stairway and platforms are built of incombustible material and wired glass.
- (h) In buildings of Class I not more than three stories in height, a stairway fire escape not less than three feet wide located and built as required by this chapter for such fire escape and placed as far as practicable from the stairway, may be considered as a stairway and may be deducted from the "width of stairs" required for the building.
- (i) The width of different stairways need not be alike, and for each four stories or fractional number of stories of the build-ing above the first four stories each stairway may be reduced six inches, but no stair in a Class VII building shail be less than three teet in width.
- (j) Stairways which are less than three feet three inches wide shall have not less than one hand rail and stairways which are more than three feet three inches wide shall have not less than two handrails. Stairways which are over eight feet wide shall have double intermediate handrails with end newel posts at least five and a half feet high.
- (k) Stairways hereafter erected shall not be spiral stairways or have any winders. Provided, however, that circular or elliptical stairways may be used if the width of treads one foot from the center of the handrail next to the well-hole is nine and one-half inches, including nosings,
- (1) Stairways shall not have risers more than eight inches high nor treads less than ten inches wide, inclusive of nosings.
- (m) The bottom of any counter-balance stairway or ladder fire escape hereafter erected on any public thoroughfare when raised shall be not less than fourteen feet above the pavement or surface of the street or alley.
- (n) The location of every stairway required by this article shall be subject to the approval of the Commissioner of Buildings.

#### ARTICLE XIX. Fire Escapes.

- 669. Fire Escapes—Number and Location.) (a) It shall be unlawful for any person, firm or corporation to construct or maintain any building of Classes I, II, III, VI, and VII within the city, unless the same shall be equipped with fire escapes as follows:
- Every building four or more stories (b) in height, except such as is used exclusively for a residence for one family shall have one or more incombustible sliding or stairway fire escapes, as required by this chapter, except as otherwise herein provided.

- (c) There shall be at least one stairway here escape constructed as required by the provisions of this enapter for each 250 persons, or fractional part thereof, who occupy any floor of any bunding hapitually and early of for whom working, steeping or fiving accommodations are provided on any one floor above the turd noor of any bunding or structure.
- (d) BUILDINGS OF ORDINARY CONSTRUCTION SHALL BE EQUIPPED WITH FIRE LECAPES AS FOLLOWS:

With door area of 6,500 square feet or less, one 24-inch stairway hre escape.

With floor area of 6,500 square reet to 9,000 square reet, two 24-mcn stairway hre escapes,

(e) BUILDINGS OF MILL OR SLOW-BURNING CONSTRUC-TION SHALL BE EQUIPPED WITH FIRE ESCAPES AS FOLLOWS:

With floor area of 8,000 square feet or less,

one 24-inch stairway hre escape.
With floor area of 8,000 square feet to 12,000 square feet, two 24-inch stairway hre escapes.

(f) BUILDINGS OF FIREPROOF CONSTRUCTION SHALL BY EQUIPPED WITH FIRE ESCAPES AS FOLLOWS:

With moor area of 10,000 square feet or less, one 24-men stairway mre escape.
With moor area of 10,000 to 20,000 square

With floor area of 10,000 to 20,000 square feet, two 24-inch stairway fire escapes. With floor area of more than 20,000 square

feet, three 24-inch stairway fire escapes.
(g) Fireproof Warehouse Buildings Shall be

EQUIPPED WITH FIRE ESCAPES AS FOLLOWS:
With floor area of 12,000 square feet or

less, one 24-inch stairway hre escape.
With floor area exceeding 12,000 square

- feet, two 24-men stairway are escapes.

  (h) A fireproof bridge built as described in Section 60s and connecting each floor of two neighboring buildings occupied by the same person, firm or corporation, shall be considered the equivalent of a fire escape, or of an interfor stairway, but not the equivalent of both.
- (i) In buildings of Class II there shall be a stairway or a fire escape as near as practicable to the end of each corridor, and where a corridor is endless the stairs and the fire escapes shall be located around and connected to said hall or corridor at distances approximately equal to each other.
- (j) The openings leading to fire escapes on hospitals shall be flush with the floor leading to the fire escape which may be inclined not more than 23 miches vertical to 12 inches of horizontal measurement, and shall be constructed and maintained with no obstructions thereon.
- (k) In buildings hereafter erected wherever stairway fire escapes are considered the equivalent of an interior stairway or as taking the place of any of the "Width of Stairs" required by this chapter, there shall be a door or casement window leading to such fire escape from each floor. Windows and doors to such fire escapes shall not be less than 24 inches in width and not less than 72 inches in height. The sill of such windows or doors shall not be more than 24 inches above the floor, unless a stair is built leading to the same.
- (1) Where a building is divided into separate areas, each such area shall be considered as a separate building and shall be equipped with stairs and fire escapes as is required for buildings by this chapter, unless otherwise herein provided.
- (m) Exterior stairway fire escapes built reads not less than 10 inches wide from nosing to riser and risers not more than 8 inches in height and having stairways extending from the inside grade to the top floor of the building or having a counterbalance section from the first story to the ground and a steel ladder from the top land-

- ing to the roof, shall be considered the equivaient of one interior stairway and one stairway increased, if the whoth of such stairway here escapes with that of one or more stairways in the banding equals the "Whoth of Stairs' required for the area of the respective buildings by this chapter.
- Where an interior stairway and its (n) stair hail and other enclosing walls are built enthery of preproof materials and where the doors of sald stair halls are automatic closing fire doors, and where such scarrway and the stair hall has at least one side on a street or aney or court, and where not less than 50 per cent of the area of the street or aftey or court wall is open and unobstructed to the outer air; and where the stairs extend from the ground to the roof; and where there are doors as wide as the stairway opening outward from a floor or landing, level with the street, aney or court, or with the floor of a fireproof tanner at the loot of such stairway, and if a court or fireproof tunnel, then where the floor of such court or preproof tunnel is level and unobstructed, and not less than double the width of such stairway, and in any case not less than eight feet in width, and where such court or hreproof tunnel extends from the doors at the base of such stairway to a public alley or street and if the floor of said court or fireproof tunnel is not level with such alley or street, then where there are stairs not less than six feet wide, leading from the floor of the court or fireproof tunnel to a street or alley, and where said last mentioned stairs are on private property; and where the stairways comply in an respects with the provisions of this chapter, then such stairway shall be considered as a stairway fire escape.
- (0) In buildings not more than two stories in height one stairway may be omitted if the building is equipped with a three-loot stairway fire escape built as required for fire escapes in this section with counterbalance drop and placed as far as practicable from the remaining stairway.
- (p) Where fireproof buildings have a printage upon public alleys or have courts or an area of not less than 320 square feet, and where such courts lead directly to a public thoroughfare, fire escapes may be permitted to be erected on such courts or such alleys and shall not be required to be erected upon the street fronts of such buildings. Such fire escapes shall be located as far as possible from stairways in the buildings, and where it is possible to erect the fire escapes on an alley or in a court they may be thus erected subject to the approval of the Commissioner of Buildings.
- (q) In fireproof buildings of Class IIa. for escapes may be located in light courts of fitty reet in the least dimension, having no opening onto a street or afley, but such fire escape must be connected with a stairway of the building at a level no higher than twenty-five feet above finished grade at the building, said stairway to terminate at the first floor level in a public corridor, giving direct egress from the building.
- (r) Such fire escapes shall not be considered as part of the width of stairs as defined in Section 666 of this chapter for such buildings unless that portion of the stairway used in connection with the fire escape is increased by the width of the fire escape, from their junction to the ground.

Hospitals two or more stories in height shall be provided with one or more stairway fire escapes not less than 40 inches between handrails. Sliding fire escapes shall have a radius or witdth of not less than 42 inches. Sliding fire escapes shall not be built on public thoroughfares and shall deposit the person from same not more than twenty-four inches from the surrounding ground, and sliding fire escapes on Class

VIII buildings shall be constructed, located and maintained in accordance with the provisions relating to Class VIII.

Wherever stairway fire escapes are considered by this chapter to be the equivalent of an interior stairway or as taking the place of any of the width of stairs, there shall be a door leading to said fire escape from each floor. Such door shall not be less than 24 inches in width and not less than 72 inches in height. The sill of such door shall not be more than 24 inches above the floor and the door shall be as wide as the stairway required on the fire escape. Where the sill is more than 24 inches from the floor, a small stairway shall be built from the floor to the window sill with treads not less than 10 inches wide and risers not more than 9 inches in height.

(s) A stairway fire escape placed on an exterior wall adjacent to a dividing or party wall shall be considered as a stairway fire escape for each building area to which it is adjacent. In such cases there shall be at least one door or window from each building area leading to the fire escape platform, and the width of each such fire escape shall not be less than 36 inches.

(t) All fire escapes shall be located and constructed to conform to the building for which they are respectively intended.

which they are respectively intended.

(u) It any building used wholly or in part for the purposes of Class VII be equipped with automatic sprinkiers, and be equipped with another building similarly used, and distant not less than twenty-nive leet and used by the same occupant, by a hreproof bridge or passageway similarly equipped, then each such there of bridges or passageways shall be held to be equivalent to and take the place of one outside standard fire escape on each of the buildings so connected.

670. Stairway Fire Escapes—Fees—Erection of—Location—Component Farts.) (a) The Commissioner of Buildings and his assistants shall determine upon the location of all stairway fire escapes before erection of same is commenced.

(b) Before the work is commenced a permit shall be obtained from the Commissioner of Buildings for which a fee of what shall be exacted.

(c) No permit for a stairway fire escape more than twenty-lour inches in width shall be granted unless a detailed plan for the fire escape, approved by a licensed architect or a structural engineer, is submitted to the Commissioner of Buildings, and a copy of such plans shall be left on file with said commissioner.

(d) All anchors for stairway fire escapes shall, wherever possible, pass through the wall of building and be secured on inside of same. Where it is possible to anchor through walls, anchors shall be put in wall not less than fitteen inches at an angle of thirty-five degrees. On buildings of steel construction, where walls are less than twenty inches in thickness there shall be steel channels at least four inches wide set on inside of building from column to column and bolted or riveted to columns, and anchors shall be bolted on finside of channels.

(e) Anchors for a platform four feet two inches or less in width shall be made of one inch square iron; over four feet two inches and not over six feet, shall be one and one-fourth inch square iron, with brace; over six feet shall be one and one-half inch square iron with brace. All anchors shall be turned up not less than eight inches at the outside of the platform on which to bolt the post.

(f) Braces shall be the same thickness as the anchors. The spread of the braces shall be the width of the platform. Where the platforms are over five feet in width, anchors shall have double braces, one to the outside and one to the center of the platform.

(g) Platforms shall be not less than fity inches wide at ends; passageways snall be not less than twenty-four inches between buildings and railings. Platforms shall be not less than five feet in length. The frames and crossbars shall be made as provided in this chapter. Platforms shall have clips at each end bolted to anchors. No door or window or shutter shall open so as to obstruct in any way the tree passage on or along a platform or a stairway fire escape.

(h) All stairway fire escapes for apartment buildings, hotels, boarding houses, lactories and onice buildings, where there are less than 100 people on any one floor, shall be not less than two feet wide between hand rans. Stringers for a 24-men stairway nre escape snam be not less than 2 menes by 78 men set 1/2 menes apart. Where stairway here escapes and their balcomes and supports are designed and constructed in accordance with the provisions of this chap-ter relating to materials permitted for such stairway hre escapes, balcomes and supports, so as to sustain a load of 100 pounds per square foot, they may be ball of Steel channels, angles, or I-beams, but when so constructed, they shall comply with the pro-visions of this chapter in an other respects. An stairway hre escapes for halfs, churches, theaters, nospitals, schools, department stores and buildings where large numbers of people congregate shall not be less than three feet wide in the clear, and all passageways shall not be less than three feet wide in the clear. Stringers for a 36-meh stairway fire escape shall be made of two bars, 3 mches by % inch, about one inch apart, or 4½ inches by % inch flat from, or of steel channels, angles or 1-beams; where over 12 feet in length, they snall have anchor and brace in the center. The tread shall be made of one-half inch square steel or iron, corner upwards, not to exceed 1% inches center, riveted at ends to 2 by % inch flat iron or steel. There shall be not less than four bars to a tread where treats are less than twenty-seven inches in length; where treads are over twenty-seven inches in length there shall be not less than six bars to a tread; there shall be a truss supporting treads made of bar iron 2 inches porting treads made of bar iron 2 inches by % inches in thickness, riveted to bars of treads in center, supported by not less than two inches by seven-sixteenths inches bolted at each end of treads. All stairs shall have an inche of about fortynve degrees. The rise shall be not more than nine inches and the tread not less than gine inches nine inches.

(i) All stairs shall have three bar railings made of one-inch bar iron for top rail, and three-fourths inch bar iron for lower rail, and when such stairs are more than three inches from the wall of the building, there shall be one or more hand rails on the wall side of such stairs.

(j) All posts used for stair fire escapes shall be made of one and one-half inch angle or channel iron not less than three feet six inches high measured at right angles with the treads of such fire escapes, and shall have braces on the outside turned upwards and fastened to the frame of the balcony or stairs, which shall be not less than half way up the posts; all stair fire escapes shall extend to the ground, either by counterbalance drop or stairs. All ladder fire escapes shall have either extension ladder or counterbalance drop from the first story of said building to the ground or sidewalk. Their location, material and construction shall be subject to the approval of the Commissioner of Buildings. Where

cables are used for counterbalance stairs they shall not be less than three-quarters of an inch in size and shall be welt oiled or greased when hung up and shall be order of greased at least twice a year. All pulleys and cables holding counterbalance drop shall be covered at bracket so as to be protected from show or ice.

(k) Wherever a stairway fire escape passes a window or door on buildings hereescape after erected, the windows or doors shall be of wired glass and shall have metal atter trames and sash, and whenever such a hre escape passes above a window, door or other opening not fitted with wired glass and metal frames the said fire escape shall be protected on the under side by sneet metal of not less than No. 20 United States gauge opposite such opening and for a distance of three feet on each side thereof. The use of intermediate platforms shall be permitted on all buildings now built or hereafter constructed whenever it is possible by their use to avoid the necessity of stairway fire escapes passing windows. All fire escapes shall be painted with two coats of mineral paint when erected, one at the shop and one upon completion at the building, and they shall be painted at least once every year thereafter.

(1) Wherever it is impossible to erect stairway fire escapes according to the provisions of this chapter, plans shall be sub-mitted to the Commissioner of Buildings mitted to the Commissioner of Buildings showing the location, material and con-struction of such stairway fre escapes as are proposed to be built before a permit is issued for the same, and if it is found to be impracticable to locate and construct fire escapes in accordance with the provisions of this chapter and that fire escapes built according to the plan presented would afford safe and practical means of exit from the building on which they are to be placed, then the Commissioner of Buildings may in his discretion approve the same. All such his escapes shan be inspected by the Commissioner of Buildings on their completion and if found to be safe, satisfactory and in compliance with said approved plans, a certineate shall be issued to such effect upon the payment of \$2.00 to the City Collector. All hre escapes other than such as it is impossible or impracticable to build in accordance with the provisions of this chapter be inspected by the Commissioner of Buildings on their completion, and it found to be in compliance with the provisions of this chapter a certificate shall be issued by the Commissioner of Buildings upon the payment of a tee of \$2.00 to the City Coltector

(m) It shall be unlawful for any person, firm or corporation to use any building until the provisions of this article shall have been complied with.

671. Ladder Fire Escapes—When Permitted.) Where a building of Class III or VI, not more than four stories in height has two flights of starrs leading from the ground to the top floor of the building and where also each occupant shall have access to at least two separate and distinct stairways located as required by the provision of this chapter from the top floor to the ground, a ladder fire escape may be used in lieu of the stairway fire escape required herein, where a counter balance drop is placed from the ladder fire escape to the ground.

\*\*672. Specifications for Ladder Fire Escapes.) (a) All single and double ladder fire escapes hereafter erected shall be in strict accordance with the following provisions:

visions:
(b) There shall be not less than three one-inch square wrought iron anchors to every five-foot balcony and not less than six for a twelve-foot balcony. Such an-

chors shall pass through the wall of the building and be boiled on the inside with a three-fourths by two-inch nut and three and one-half inch iron washer back of the nut, where the wall is not over twenty inches thick; but where the wall is over twenty inches thick anchors shall be inserted at least eight inches into the wall at an angle of thirty-five degrees.

(c) Where a ludder fire escape is permitted by this chapter, the side guards shall be two by two coefficients unch flat iron. All ludder fire escapes shall be seventeen inches or more in width in the clear. No . . . pipe nor rusted or defective material shall be used in the construction of ludder fire escapes. Rungs of ludders shall be of not less than one-hai-inch square iron with corners upward, so as to give a sefe footing. Rungs shall be receted and shall be constructed with fourteen-inch centers.

\*Amended February 20, 1911.

(d) The brace for the anchors shall be at least twenty inches spread and shall extend into the wall tour inches; no other form of anchor shall be allowed except by special permit from the Commissioner of Buildings.

673. **Balconies—Construction of.)** balconies hereafter erected shall be eitner steel or wrought iron and capable of sustaining a weight of one hundred pounds to the square foot. The balcony frame shall be made of not less than two-inch by two-inch by one-fourth inch angle iron which snall be securely riveted together with crossbars every two feet. Such bars shall be punched one-half inch square close to the top of the bar on two inch centers and onehalf inch square iron bars shall be forced through the same. The crossbars shall be securely riveted to the angle iron frame. Securery rivered to the angle non frame. The crossbars for a balcony twenty-eight inches wide shall be two inch by three-eighths inch. Balcony frames over twenty-eight inches wide shall be made of not less than two by three-eighths less than two three-eighths bv inch iron and made to conform with the increased dimensions of iron in crossbars; for thirty-six inch balcony or more they shall be two and one-half inch by threeeighths inch. All balconies over this width shall have a two-inch "T" iron through the center of the balcony for the bars to rest upon; provided that such balconies and platforms of buildings of Class 11c may be built as described in Section 268 of this chapter. Such balconies shall have a substantial cast or wrought iron post every three feet bolted to the balcony. No bal-cony shall have less than three guard rails which shall be of wrought iron or new iron pipe not less than three-fourths inch in diameter and the ends shall be securely anchored to the wall of the building and shall be not less than ten inches on an angle of Where stairway fire esthirty-five degrees. capes and their balconies are designed and constructed in accordance with the provisions of this chapter to sustain a load of one hundred pounds per square foot, they may be built of steel channel angles or I-beams, but in such cases they shall comply with the requirements of this chapter in all other respects.

674. Standpipes—Pumps—Axes, Etc., and Fire Fighting Apparatus.) (a) In every building one hundred feet or more in height not provided with a three-inch or larger inside standpipe and in all buildings hereafter constructed of a greater height than seventy-five feet excepting buildings used for the purposes of Class IIc and Class V as herein elsewhere provided for, and in all buildings of a greater height than five stories now or hereafter used for hotels or public lodging house purposes, there shall be installed one or more four-inch standpipes, which shall extend from the basement to the roof and which shall be connected at

the outside of the street or alley side of the building with a Siamese connection provided with iron cap for use of the lire department, and which shall be provided with one hose the roof of said building, on each floor and in the basement thereof, with sufficient hose attached to reach any point thereof. The pattern, quality, installation and maintenance of such standpipe, hose and couplings, shall be subject to the approval of the Five shall be subject to the approval of the Fire Marshal.

(b) In any of the buildings herein re-ferred to which are completely equipped with an approved automatic sprinkler system it shall not be necessary to install inside standpipes as above provided for.

675. Grain Elevators, Malt Houses and Cold Storage Houses—Steamer Connections—Sprinkler System.) The interior of all grain elevators and malt houses of a height of fifty or more feet which are not of hreproof construction, and which have a capacity of two hundred and fifty thousand bushels or over; and the interior of all cold storage houses of a height of four or more stories which are not of fireproof construction and which have a ground floor area of ten thousand or more square feet, shall be completely equipped with either a dry or wet approved automatic sprinkler system with a feeder or riser pipe or pipes not less than four inches in diameter, leading from one or more Siamese steamer connections provided with iron caps, all of which shall be installed and maintained subject to the approval of the Fire Marshal.

676. Grain Elevators, Malt Houses and Cold Storage Kouses—Watch Service.) (a) Grain elevators which are equipped with an approved fire alarm system, properly maintained; or grain elevators, malt houses and cold storage houses which are now equipped cold storage houses which are now equipped with standpipes and hose of approved quality, and which have outside standpipes not less than 2½ inches in diameter, and Siamese steamer connections properly located; and which are equipped with fire extinguishers, water barrels and pails distributed at proper intervals on all floors; and where some approved electric watch service and fire alarm system is maintained, and a watchman is employed to pull such stations at least once an hour every day and night of the year, all of which shall be subject to the approval of the Fire Marshal, will not be required to install additional inside standbe required to install additional inside standpipes as provided in the foregoing sections.

(b) It shall be unlawful for any person, firm or corporation to erect, use or maintain any building as a grain elevator, malt house or cold storage house unless such building complies with all the provisions of this secor unless the Fire Marshal has such building examined and certifies to the Commissioner of Buildings that such building complies in all respects with the provisions of this section, and each day's unlawful use of such building, as above provided, shall be considered a separate offense.

677. Steamer Siamese Connections.) There shall be a Siamese connection at the botshall be a Siamese connection at the bottom of each standpipe, so that two steam fire engines may be attached to it without interfering with each other. Such Siamese connection shall be within easy reaching distance from the sidewalk and be securely anchored to the wall of the building. The owner, agent, occupant or person in possession, charge or control of the premises where such standpipe and Siamese connection are located, is hereby required to provide such covering or protection as is provide such covering or protection as is provided for in Sections 674 and 675 to the fittings of said Siamese connection for the purpose of keeping said fittings and connection clear and unobstructed. The protection or covering herein referred to shall apply to all inside and outside standpipes

and connections to automatic sprinkler equipment now in existence or hereafter installed.

678. Fire Escapes—Signs Indicating Location.) Every published cation.) Every building required to be equipped with metallic ladder fire escapes and wrought iron or steel balconies, sliding or stairway fire escapes, or other fire escape devices, shall have displayed in conspicuous places, on each floor or such building, notices sufficient in number and in plainly legible type at least six inches in height, indicating and showing the location of such fire escapes and the easiest way to reach them. If such notices be not dis-played within thirty days after such equipment is installed and kept continuously displayed the Commissioner of Buildings shall cause the building to be closed and kept closed until the provisions of this section shall have been complied with.

679. Stairs and Fire Escapes—Obstruction, Change in Construction.) It shall be unlawful under any circumstances to close up or obstruct any stairways or fire escapes or any buildings or the approaches leading thereto. No change in the position or construction of any such stairway or fire escape shall be made, unless the permission of the Commissioner of Buildings shall first have been obtained.

# ARTICLE XX.

#### Ventilation.

680. Ventilation in Buildings of Classes IV, V, VII and VIII.) (a) The air in any room used as an auditorium in buildings of Class IV and V, hereafter erected and the air in any room used as a classroom or assembly hall in buildings of Class VIII, hereafter erected, shall be changed, so as to provide each person for whom seating accommodation is provided in such auditorium. classroom or assembly hall with at least 1,500 cubic feet of air per hour.

(b) In buildings of Class VII, hereafter erected, on floors frequented by the public the air in such rooms shall be supplied at

the following rates:

For each person in basement, 2.000 cubic feet per hour.

For each person in 1st to 3rd stories, both inclusive, 1,500 cubic feet per hour.

For each person in 4th story and above, except as hereinafter provided, 1,300 cubic feet per hour.

For each person in grocery departments and restaurants, 1.500 cubic feet per hour.

(c) For the purpose of determining the number of people on any floor in buildings of Class VII, in calculating the means of or class vii, in calculating the means of ventilation, the following floor area per per-son per floor shall be taken as the basis: Basement, per person, 20 square feet of floor area exclusive of walls, stairs and ele-

vators.

First story, per person, 20 square feet of floor area, exclusive of walls, stairs, elevators, and enclosed show windows.

Second story, per person, 50 square feet of floor area, exclusive of walls, stairs, elevators, and enclosed show windows.

Third story, per person, 60 square feet of floor area, exclusive of walls, stairs and elevators. vators.

Fourth story and above per person, \$0 square feet of floor area, exclusive of walls. stairs and elevators, except as hereinafter provided.

(d) Grocery departments and restaurants, per person, 40 square feet of floor area, exclusive of walls, stairs and elevators.

(e) The amount of carbon dioxide in the air of any such auditorium, classroom or assembly hall or space frequented by the public in Class VII buildings shall not be permitted to rise above 10 parts of carbon dioxide per 10,000 parts of air, measurements being taken at levels from two and one-half feet to eight feet above the floor, generally distributed, and the temperature in such spaces when artifically heated shall not exceed 68 degrees Fahrenheit. Lelative numidity shall not be less than 45 degrees

nor more than 80 degrees.

(f) The air in any room used as an auditorium in buildings of classes IV and V, constructed prior to the passage of this or-dinance, and the air in any room used as a classroom or assembly half in buildings of Class VIII. constructed prior to the passage of this ordinance, shall be changed, so as to provide each person for whom seating accommodation is provided in such auditorium, classroom or assembly hall with at least

1,200 cubic feet of air per hour.

(g) The air in any rooms and floors in buildings of Class VII, erected prior to the passage of this ordinance, shall be supplied, by mechanical or other means, at the fol-

lowing rates:

For each person in basement, 1,600 cubic feet per hour.

For each person in 1st to 3rd stories, both

inclusive, 1,200 cubic feet per hour.

For each person in 4th story and above, except as hereinafter provided, 1,040 cubic feet per hour.

For each person in grocery departments and restaurants, 1,200 cubic feet per hour.
(h) For the purpose of determining the

determining the number of people on any floor in buildings of Class VII, in calculating the means of ventilation, the following floor area per person per floor shall be taken as the basis:

Basement, per person. 20 square feet of floor area exclusive of walls, stairs and ele-

vators.

First story, per person, 20 square feet of floor area exclusive of walls, stairs, elevators, and enclosed show windows.

Second story, per person, 50 square feet of

floor area exclusive of walls, stairs, elevators, and enclosed show windows.

Third story, per person, 60 square feet of floor area exclusive of walls, stairs and ele-

vators.

Fourth story and above, per person, 80 square feet of floor area exclusive of walls, stairs and elevators, except as hereinatter provided.

Grocery departments and restaurants, per

- erson, 40 square feet of floor area exclusive of walls, stairs and elevators,

  (i) The amount of carbon dioxide in the air of any such auditorium, classroom or assembly hall or space frequented by the assembly hall or space frequented by the public in Class VII buildings shall not be public in Class VII buildings shall not be permitted to rise above 12 parts of carbon dioxide per 10,000 parts of air, measurements being taken at levels from two and one-half feet to eight feet above the floor generally distributed; and the temperature in such spaces when artificially heated shall be the content of the not exceed 70 degrees Fahrenheit. The relative humidity shall not be less than 40 degrees nor more than 85 degrees.
- (j) The word "auditorium" as used in this section in connection with buildings of Classes IV and V shall be construed as including the main floor, balcony and galleries.
- In buildings hereafter erected for or converted to the use of a factory, mill or workshop, the air shall be changed, except as hereinafter provided, so as to provide each person for whom working accommodations are provided therein with at least 1.500 cubic feet of air per hour.
- (1) In buildings used for the purposes of a factory, mill or workshop at the time the passage of this ordinance, shall be changed, except as hereinafter provided, so as to provide each person for whom working accommodations are provided therein with at least 1,200 cubic feet of air per hour.

(m) In any building or room hereafter erected tor or converted to the use of a factory, mill or workshop the amount of carbon dioxide in the air, except as hereinatter provided, shall not be permitted to rise above ten parts of carbon dioxide per 10,000

parts of air.

(n) in buildings or rooms used for the purpose of a factory, mill or workshop at the time of the passage of this ordinance, the amount of carbon dioxide in the air, except as hereinatter provided, shall not be permitted to rise above twelve parts of carbon dioxide per 10,000 parts of air. The measurements in each case above enumerated in this paragraph shall be taken at levels from two and one-half feet to eight feet above the floor, distributed generally; and the temperature in such spaces, when artificially heated, shall not exceed 68 degrees Fahrenheit, except as hereinafter provided; the relative humidity shall not be less than 40 degrees nor more than 85 degrees.

(o) The above provisions and standards as to ventilation shall not apply to storage rooms or vaults or any place where the manufacturing processes therein conducted would be materially interfered with, or where manufacturing processes therein conducted would produce considerable quantities of free carbon dioxide, except that the air in such rooms or vaults or in any places of manufacture shall not be permitted to become detrimental to the health of those wno

enter or work therein.

(p) No part of the fresh air supplied in compliance with the requirements of this section shall be taken from any cellar or basement.

- (q) No person, firm or corporation, either as owner, proprietor, lessee, manager or superintendent of any factory, mill, workshop or any other building where one or more persons are employed, shall cause, permit or allow the same or any portion or apartment of any room in such factory, mill or workshop, to be overcrowded or to have inadequate, faulty or insufficient light or ventilation.
- (r)No person shall be exposed to any direct draft from any air inlet, nor to any draft having a temperature of less than sixty degrees.
- All poisonous or noxious fumes or gases arising from any process, and all dust of a character injurious to the health of the persons employed, which is created in the course of a manufacturing process, within such factory, mill, workshop or laundry, shall be removed, as far as practicable, by either ventilating or exhaust devices either ventilating or exhaust devices.

ARTICLE XXI. Elevators and Their Enclosing Walls.

681. Elevators-Passenger and Freight-Permit Permit for Construction—Fee—Penalty.)
(a) Before proceeding with the construction or alteration of any passenger or freight elevator, except such as are hereinafter specially exempted from the provisions of this chapter, a permit for such construction or alteration shall be obtained from the Commissioner of Buildings either by the owner or agent of the building in which such elevator is to be constructed or in which such alterations are to be made, or by the contractor who is about to construct or alter such elevator.

It shall be unlawful for any such (b) owner, agent, or contractor to permit or allow the construction of any such elevator or the making of such alterations, or to proceed with cr in or about any of the work of construction or alteration of any such elevator until such permit shall first have been obtained. Such permit shall be issued by the Commissioner of Buildings after application shall have been made to him therefor by any such owner, agent or contractor, specifying the number and kind of elevators

which it is desired to construct, or the na-ture of the alternations to be made and the location of the building or structure in which the same is or are to be placed or made. Such application shall be accompanied with such plans and specifications as shall be necessary to advise and inform said Commissioner of the plan of construction, type of elevator. kind of alterations and the location thereof. If such plans and specifications shall show that such elevator or elevators is or are to be constructed or erected or altered in conformity with the provisions of this chapter, the Commissioner shall approve the same and shall issue a permit to such applicant upon the payment of such applicant of a fee of two dollars for each elevator to be constructed, erected or each elevator to be constituted, erected of altered, and such fee shall be known as a permit fee and shall not be held to cover the cost of any inspection which shall at any time thereafter be made of such ele-vator or elevators when constructed, or of any alterations made.

(c) All contractors or persons, firms, or corporations, engaged in the manufacture and work of installing iron doors on passenger or freight elevators, or of installing wire work enclosures around elevators shall be considered to the complete of the considered of

wire work enclosures around elevators snall secure a permit from the Commissioner of Buildings for the work on each such elevator, the fee for which shall be two dollars for each elevator.

(d) It shall be unlawful for any person, firm or corporation either as owner, lessee, contractor or agent of any building or structure in which any elevator or elevators are ture in which any elevator or elevators are to be constructed or altered to proceed with said work without securing a permit as herein required for such construction or alteration, and no such permit shall be issued until such person. firm or corporation, lessee, contractor or agent shall have complied with all the requirements of this chapter.

682. Enclosure of Elevator Shafts in Non-Fireproof Buildings.) In all non-fireproof buildings hereafter erected all passenger elevators and all freight elevators, except such as are expressly excepted by this chapter, shall be inclosed in a wall of brick, tile or such incombustible material as may, from time to time, be approved by the Commissioner of Buildings as proper and suitable for the purpose: such inclosure shall extend from the foundation to the roof of such building, and shall be supported independently of the floor construction; provided, further, however, that the provisions of this section shall not apply to any non-fireproof building which is equipped throughout on every floor and in every room thereof and in all stairways, platforms, elevator shafts, elevator hoistways and well holes with an automatic sprinkler system approved by the Fire Marshal.

683. Enclosure of Pits and Shafts in Easements.) In all buildings heretofore or hereafter erected, whenever any elevator shaft extends down into a basement or subbasement, that portion thereof extending below the street level shall be inclosed in walls of brick, tile or other fireproof ma-terial, and the door openings in such inclosure shall be protected by incombustible Where such elevator shafts do not extend down into the basement they shall be provided with fireproof pits at the lowermost floor level above which they serve, and

cables or other elevator equipment.

684. Enclosure of Dumb Water Shafts—
buildings

15 oil non-fireproof buildings hereafter erected, the dumb waiter shafts shall be inclosed with brick, tile, reinforced concrete, or cement plaster not less than two inches thick or metal studs and lath.

685. Doors-On Elevators.) In all elevator shafts which are herein required to be enclosed with fireproof walls, the door openings shall be equipped with doors of incombustible material, which shall be made to open from the outside by means of a key or other device satisfactory to the Com-missioner of Buildings.

- 686. Hatch Doors—Freight Elevators.) Elevators, used exclusively as freight elevators constructed and in operation at the time of the passage of this ordinance need not have enclosing walls, but in all such cases there shall be at every floor through which such freight elevators pass automatic hatch closers or automatic doors, made in such manner that they will fully close each well hole when the temperature in such well hole exceeds 140 degrees Fahrenheit; and it shall be the duty of the owner, agent or person in possession, charge or control of a building in which such elevator is maina building g in which such elevator is main-keep such hatch closers or doors at all times in good working order. Such automatic hatch closers shall be examined by the Commissioner of Buildings and the Fire Marshal and if said officials shall find that such doors will automatically close when the temperature at or near such doors exceeds 140 degrees Fahrenheit, and that the conditions of construction and operation of such doors or hatch closers are such that there is no reasonable probability of their getting out of order and failing to operate when required, and that in their construction or operation there is nothing that is likely to cause accidents to or interference with the elevator service in such hatch holes which they were intended to close, and that the building in which such freight elevator is in use is equipped with stairways, fire escapes and passenger elevators sufficient to offer ample means of escape from such building in case of fire, for all persons employed or for all persons in such building, then, and in such case only, shall the use of such hatch doors or closers be permitted. All freight elevators in non-fireproof buildings shall comply with the preceding requirements of this section, or shall have inclosing walls of incombustible or fireproof construction. Such elevators are to be inspected semi-annually and oftener when, in the opinion of the Commissioner of Build-ings, such inspection is necessary and such fees shall be paid for said inspection as otherwise provided in said chapter.
- Safety Device.) (a) 637. **Safety Device.**) (a) Every passenger and freight elevator now in operation or hereafter installed, except such as are hereinafter exempted from the provisions of this chapter, shall be provided with a speed governor and such other efficient device to secure the safe operation of such passenger or freight elevator, and to prevent the cab or car of such elevator from falling and to secure the safety of the cab falling, and to secure the safety of the cab or car and its load in case it does fail, as may be required by the Commissioner of Buildings. Such speed governor and other devices shall be subjected to such a prac-tical test as may be determined by the Commissioner of Buildings for the purpose of ascertaining the efficiency of such safety device.
- (b) It shall be the duty of the Commissioner of Buildings to make such test of each and every device upon all elevators, and no elevator shall be permitted to be run until such test has been made.
- 688. Safeguards for Elevators.) Where the counterweights travel in the same hatchway with an elevator car, the portion of the car contiguous to the weights shall be protected from the top to the bottom of the car by a suitable guard.

(b) All freight elevators shall be provided with a guard at least six feet high. All elevator cabs or cars, whether used for freight or passengers, shall be provided with some device whereby the car or cab may be held in the event of accident to the shipper rope or hoisting machinery or controlling

(c) No passenger elevator hereafter erected shall be installed with a freight compartment either below or above the car.

(d) All hoistways, hatchways, elevator wells and wheel holes in factories, mercantile establishments, mills or workshops, shall be securely fenced, inclosed or otherwise safely protected, and due diligence shall be used to keep all such means of protection closed, except when it is necessary to have the same open, in order that the said hatchways, elevators or hoisting apparatus may be used.

(e) It shall be unlawful to erect or maintain an elevator where such elevator or its counterweight descends into any passage-

thoroughfare.

(f) There shall be directly under the sheaves at the top of every elevator hatchway, a grating of steel or heavy wire mesh properly supported by steel or iron and capable of sustaining a load of not less than 500 pounds.

(g) All counterweights hereafter installed shall have their component parts so fastened together as to provent any piece or pieces from becoming detached from the guides should the counterweights be accidentally drawn to the top of the hatchway.

(h) Where drum counterweight cables in through or pass by the car counterweights to weights underneath, they shall be provided with a suitable covering to prevent their chafing and wearing on the coun-

terweights.

(i) Where elevators other than hand-hoists and sidewalk elevators are not in-closed with fireproof or incombustible ma-terial, as is elsewhere herein specified in this Article, the well-hole of such elevator shall be enclosed with a wire guard not less than six feet high. The counterweights and the immediate space through which they travel must be protected from the floor to the ceiling with a wire guard or with other incombustible material. There must be on all elevators hereafter constructed a clear space of not less than two feet between the bottom of the hatchway and the level of the lower floor landing when the car is at its lowest position, and there must be a clearance of at least four feet from the top of the crossbeam of the car to the lower side of the grating under the overhead sheaves. Whenever there is conflict in regard to the manner of enclosing any elevator shaft or portion thereof between this section and Sections 682, 683 and 684, the provisions of latter sections shall prevail.

All passenger and freight elevators hereafter installed, except sidewalk or hand elevators, shall have an artificial traveling gas or electric light attached to the maintained in good working condition.

(k) All power driven electors hereafter constructed or installed shall have at least hoisting cables for the cage and cables for each counterweight. The lifting and counterweight cables shall have at least one full turn of the cable on the drum when the car has run its limit.

(1) It shall be unlawful to change hand-hoist to a power-driven elevator with-out first making application to the Commissioner of Buildings for a permit for such change, and it shall be unlawful to connect an electric motor or any other appliance to the hand elevator machinery without the approval of the Commissioner of Buildings.

All elevators, except hand elevators operated by a pulley rope and sidewalk ram or chain hoist elevators, and elevators used in tunnels for freight service only, shall be

equipped with a safety speed governor.

(n) Where ropes or cables are used to operate safety devices, a weight shall be

properly attached to the same in such a manner as to insure the necessary tension on such rope or cables for proper performance of the safety devices.

All elevators propelled by electricity shall be provided with an additional device not operated by a link belt or sprocket chain which will automatically stop the elevator machinery when the car has reached its limit of travel. It shall be unlawful to construct or maintain any elevator equipped with a sprocket chain or link belt device or

devices connecting the operating device and controller.

(p) An emergency switch which will disconnect the current shall be provided in all passenger elevators hereafter installed which are operated by an electric controller carswitch, and such cars shall be so constructed that they will automatically stop when the current is disconnected.

(q) The underside of the floors or other parts of a building which project into passenger elevator shafts shall be equipped with a smooth steel guard curved and sloped from the enclosure of said elevator to the edge of such projection for the width of the door to such elevator car and the slope of the guard plate shall not be less than sixty degrees with the horizon.

(r) The provisions of this section requiring the equipment of elevators with safety devices shall not apply to any hand hoists, elevator or hoist used solely for hoisting materials or tools in any building in course of construction, but the Commis-sioner of Buildings shall make such reasonable requirements as he may deem necessary for public safety in the operation of such hand hoists, elevators or hoists used solely for hoisting materials or tools in such buildings while under construction.

Inspection-Test-Certificate to Be Posted.) (a) Every elevator now in opera-tion or which may be hereafter installed, together with the hoistway and all equip-ment thereof, shall be inspected under and by the authority of the Commissioner of Buildings at least once every six months, and in no case shall any new elevator be placed in operation until an inspection of the same has been made.

(b) It shall be the factor of

(b) It shall be the duty of every owner or agent, lessee or occupant of any building wherein any elevator is installed and the person in charge or control of any elevator to permit the making of a test and inspection of such elevator or elevators and all devices used in connection therewith upon demand being made by the Commissioner of Buildings or by a duly authorized Elevator Inspector within five days after such de-

mand has been made.

Whenever any such elevator has been inspected and the tests herein required shall have been made of all safety devices with which such elevator is required to be equipped and the result of such inspection and tests shows such elevator to be in good condition, satisfactory to the Commissioner Buildings, and that such safety devices have been provided in accordance with the requirements of this chapter and are good working condition and in good repair. it shall be the duty of the Commissioner Buildings to issue or cause to be issued a certificate setting forth the result of such inspection and tests and containing the date of inspection, the weight which the eleva-tor will safely carry and a statement to the effect that the shaft doors, hoistway and all equipment, including safety devices, are constructed in accordance with the provisions of this chapter, upon the payment of the inspection fee required by this chapter.

(d) It shall be the joint duty of the owner, agent, lessee or occupant of the building in which such elevator is located and of each person in charge or control of such elevator to frame the certificate and place same in a conspicuous place in each elevator.

(e) The words "safe condition" in this section shall mean that it is safe for any load up to the amount of weight named in

such certificate.

(f) Where the result of such inspection or tests shall show such elevator to be in an unsafe condition or in bad repair, or shall show that the safety devices, or any of them, which are required by this chapter, have not been installed, or if installed, are not in good working order. are not in good working order or not in good repair, such certificate shall not be issued until such elevator, its hoistway and equipment or such device or devices shall have been put in good working order, satisfactory to the Commissioner of Buildinspection fees herein required The shall be paid either at the time application is made for inspection or upon the completion of such inspection and tests.

Power of Commissioner to Stop Operation of Elevators.) (a) Whenever any building or elevator inspector finds any passenger or freight elevator or any of its running parts or automatic devices or other equipment out of order, or in an unsafe condition he shall immediately and the condition to dition, he shall immediately report the same to the Commissioner of Buildings, together with a statement of all the facts relating to the condition of such elevator or eleva-

tors.

(b) It shall be the duty of the Commissioner of Buildings upon receiving from any inspector a report of the unsafe condition of any elevator, to order and cause such elevator not to be used until the same shall have been placed in a safe condition, and it shall be unlawful for any owner, agent, lessee, or occupant of any building, wherein any such passenger or freight elevator is located within the city, to permit or allow any such elevator to be used after the receipt of a notice in writing from the Commissioner of Buildings that any such eleva-tor is out of order or is in an unsafe condition and until said elevator has been put in a safe and proper condition as required by the provisions of this chapter.

#### ARTICLE XXII.

#### Storage of Oils.

Construction of Buildings for Storage of Oils Prohibited-Exceptions.) (a) It shall hereafter be unlawful for any person, firm or corporation to build, construct or erect any building designed for the storage of crude petroleum, gasoline, naphtha, benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine, coal oil, rock oil. earth oil, or any other liquid except such as will stand a test of one hundred and fifty degrees Fahrenheit according to the method of John Tagliabue.

(b) Buildings heretofore creeted designed for the storage of the fluids mentioned in the preceding paragraph must conform to the following provisions:

(e) The walls shall be of brick, stone or concrete, and shall be not less than sixteen concrete, and shall be not less than sixteen inches thick or more than sixteen feet high. The lower floor of such buildings shall be at least three feet below the grade of the adjoining street and shall be made of earth, concrete, or brick. The roof of such buildings shall be made of tile, metal or other incombustible material, and the outside walls of any such buildings having a flat roof shall extend at least eighteen inches above the roof. The coping upon the roof of such buildings shall be made of incombustible material. Such buildings shall be detached from all other buildings and shall be properly ventilated. Where any such building shall be located less than twenty-five feet away from any other building or structure, the wall or walls of such oil storage build-

ing on the side or sides thereof within such distance of twenty-five feet from any other building or structure shall have no windows or other opening therein; provided, how-ever, that if such building cannot be so constructed that no outside wall thereof shall be less than twenty-five feet away from any other building or structure, in such case, openings may be made in the wall of such building which is located farthest away from any other building or structure for the purpose of admitting light structure for the purpose of admitting light or providing means of access thereto or egress therefrom. If such opening be a window, the glass in such window shall be fire-resisting glass in metal frame, and such window shall be provided with a shutter.

(d) No such building shall be occupied for any purpose other than the storage of oils, and no person shall be permitted to use any such building as a sleeping apartment

or dwelling place.

(e) Such buildings and the equipment thereof, including the protection of the doors and windows, shall be constructed according to plans and specifications submitted to and approved by the Commissioner of Buildings.

692. Storage of Oils.) (a) It shall be unlawful for any person, firm or corporation to keep or store crude petroleum, gasoline, naphtha. benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine, oil, rock oil, earth oil, or any other liquid except such as will stand a test of one hundred and fifty degrees Fahrenheit, according to the method of John Tagliabue, in any quantity exceeding ten gallons, upon or in any building, structure or premises, with-in the City of Chicago, except in such a building or structure as has been heretofore constructed in accordance with the provisions of Section 691, or in such tanks as are provided for in Section 693 of this Article.

(b) Where ten gallons or less of any of the above-mentioned oils or fluids, except such as will stand the test above mentioned, are kept upon or in any building or structure within the city, they must be kept in safety cans made of not less than 24-gauge galvanized iron or other suitable metal approved by the Fire Marshal, with opening or openings protected by self-closing stops, and such safety cans must be of a type approved by the Fire Marshal.

No gas, candle, oil or other like ar-

tificial light or lighted stove, gas grate or other open flame or electric switch or cut-out of any kind shall be allowed within out of any kind shall be allowed within fifteen feet of any receptacle or receptacles containing any of the oils or fluids mentioned in this Article, nor shall electric switches or cutouts be located closer than four feet to the floor in rooms containing such oils on fluids.

such oils or fluids.

\*693. Tanks for Storage of Cils.) Any person, firm or corporation desiring use any space underneath the surface of the ground, or underneath any building in the City of Chicago, except in such a building or structure as was formerly authorized un-der the provisions of Section 691 of this Article, for the construction, maintenance or use of any tank thereunder for the storage of any one or more of the oils or fluids mentioned in Section 692, shall first obtain permit so to do from the Commissioner of Buildings of the City of Chicago. applicant shall pay to the City Collector a fee of two dollars (\$2.00) for each tank of two dollars (\$2.00) prior to the issuance of such permit, which fee shall cover the cost of the inspection thereof, and no such permit shall be without first being approved by the Fire Marshal of the City of Chicago, and said permit may be revoked by the Mayor at any time for a just cause.

- (b) Applications for such permits shall be in writing, stating specifically the location, the space desired to be used, the length, breadth and depth, together with the measurement in feet from the surface of the ground to the top of such tank and shall contain the plans and specifications for the construction of said tank, its connections, fittings, openings and safety appliances.
- (c) Tanks for the underground storage of the oils or fluids mentioned in Section 692 with the exceptions therein provided shall be made of galvanized steel, open hearth basic steel or wrought iron of a gauge depending upon the capacity, as follows: 14 U. S. gauge for capacities of 180 gallons or less; 12 U. S. gauge for capacities of 181 to 300 gallons; 7 U. S. gauge for capacities of 301 to 4,000 gallons; one-fourth inch with three-eighths inch heads for capacities of 4,001 to 10,000 gallons; three-eighths inch for capacities of 10,001 to 12,000 gallons. All portions of such tanks shall be either riveted, and soldered or caulked, or welded or brazed together and made oiltight and shall be coated on the outside with tar, asphaltum or other rust-resisting material. Every such tank exceeding 4,000 gallons in capacity shall have a manhole.
- (d) Tanks (other than portable filling tanks hereinafter mentioned, those located in buildings heretofore constructed under the provisions of Section 691 of this article and those located beneath or attached to buildings as hereinafter provided in this section) shall be placed and maintained with the tops at least two feet under the surface of the ground and shall have no building or structure of any kind over or above them. When located not less than two hundred feet away from any building or structure or from any street, alley or public way, dock, water front, lumber yard or any yard or place where combustible materials are kept or stored, such tanks shall contain not to exceed twelve thousand six hundred galto exceed twelve thousand six hundred gallons each, and when located less than two hundred feet away from any building or other structure or from any street, alley or public way, dock, water front, lumber yard or any yard or place where combustible materials are kept or stored, shall contain not to exceed one thousand gallons each; provided, however, that the aggregate capacity of tanks located within thirty feet of any building shall not exceed five thousand gallons. No such tank shall \* \* \* be connected either directly or indirectly with any public or private sewer, drain or with any public or private sewer, drain or catch basin in the City of Chicago unless an approved oil separator is provided, or un-less such tank in and of itself, or together with its fittings, is capable of performing the functions of an oil separator, and so installed as to prevent the discharge of any of the liquids mentioned in Section No. 601 into said sewers, drain or catch basin. All pipes leading to or from such tanks shall be of puges maning to or from such Genes shall be of galvanized wrought from with heavy galvan-ized cast-from or brass fittings, protected against injury, and shall be so placed that the tops of such tanks shall be lower than the level of the lowest pipe in the building used in connection therewith and all graph the level of the lowest pipe in the building used in connection therewith, and all such tanks shall be so placed that no artificial light shall be required while filling. Each tank shall be provided with a filler pipe of galvanized iron or brass, not less than one and one-quarter inches in diameter, entering at the top of the tank and extending not less than four inches below the top of the tank, the upper end of which said filler pipe shall terminate in a locked screw cap or metal filler box, which must be kept sey locked at all times, except when such is being filled, and each such tank, hydraulically operated, shall have a vent curely tank is being fifted, and each such tank, unless hydraulically operated, shall have a vent pipe so arranged that the filler pipe cannot be opened without opening the vent pipe unless permanently open vent pipe is used, in which case such vent pipe shall be not less than one inch in
- d ameter and shall be carried up to the outer air and terminate in a weatherproof hoad. The tops of all fill pipes and vent pipes shall be provided with a brass screen of not less than thirty mesh to the inch. Tanks located inside of building walls, or within ten feet thereof, must have permanently open vent pipes, which shall be carried up ten feet abvee the roof of the building to which they are attached and terminate at least twenty feet from all openings in adjacent buildings. Where vent pipes are located at the surface of the ground, they shall terminate in a locked screw cap, or other device, which shall be approved by the Fire Marshal. Fill and vent pipes shall be so located as not to create exposure to openings in any building. The installation of said tanks shall be subject to the supervision and approval of the Fire Marshal of the City of Chicago and they shall not be covered up until the said Fire Marshal has inspected them and found that the tanks and their equipment comply with the provisions of this section and until said Fire Marshal has issued to the owner thereof a certificate to that offect.
- (e) Tanks for the storage of one or more of the oils or fluids mentioned in Section 692 of an aggregate capacity of not more than three hundred gallons, may be installed beneath buildings. Every such tank shall be enclosed by a casing of concrete at least six inches in thickness and shall be so sit-uated and constructed that the top of such tank shall be at least two feet below the upper surface of the lowest floor, which shall be constructed of concrete not less than six inches thick. The filling pipes of tanks in-stalled underneath buildings as provided in this paragraph must terminate outside of the outer wall of said building in a locked screw cap or other device of a design which shall be approved by the Fire Marshal ot the City of Chicago, and said screw cap or device must be kept securely locked at all times except when such tank is being filled, and where any such filler pipe runs to a sidewalk, alley or public highway it must terminate in a locked screw cap or other device of a design which shall be approved by the said Fire Marshal and which shall be set llush with the surface of the sidewalk, alley or highway, and provided with a locked iron cover, which must be kept securely locked at all times except when such tank is being filled. The filling pipe and the vent pipe of any such tank must be laid underneath the concrete floor of the building until they reach the outside of the outer wall of said building. Such tanks shall comply in all other respects with the provisions, conditions and requirements of the preceding paragraphs of this section; provided, however, that no such tank shall be constructed underneath any building any part of which is used for residence, hotel or lodging purposes. Such tanks must be supplied with pumps or other devices for the removal of the contents thereof which shall have been approved by the Fire Marshal of the City of Chicago. Each pipe connecting such tank with the pump or the device for the removal of its contents shall be of galvanized iron and must be so laid that no portion thereof is lower than its level at the point where such pipe is connected with the tank, and it shall be pitched upward from the tank to the pump or other device used for the removal of the contents of such tank, and said pipe shall be laid at least eighteen inches below the surface of the ground, and all exposed portions thereof shall be properly protected.

(f) Sealed portable filling tanks of a capacity of not more than sixty gallons may be used inside of garages for the storage and handling of any one or more of the oils or fluids mentioned in Section 692. Such tanks shall be constructed of not less than No. 7 U. S. gauge steel, supported on steel wheels not less than thirty inches in diameter with rubber tires, and provided with

an approved pump or other device for the removal of the contents thereof, and a hose, of length not to exceed eight feet, through which the oil or fluid is to flow.

(g) Pressure tanks not exceeding six gallons oil capacity, constructed of not less than No. 18 U. S. gauge steel, and used in connection with lighting systems, approved by the Fire Marshal, may be placed above ground and attached to the outside walls of buildings.

\*Amended December 18, 1911.

694. Oil Tanks Used in Connection With ngines: Gas Producers. Etc.) (a) Tanks Engines; Gas Producers, Etc.) (a) for storing oils or liquids which will stand a test of one hundred and fifty degrees Fahrenheit, according to the method of John Tagliabue, used in connection with engines gas producers, furnaces, ovens or other oil burning equipments, must be constructed in accordance with the provisions of Section 693, and, if installed inside of buildings must be limited to an aggregate capacity of 1,000 gallons, and must be placed beneath the lowest floor in the manner specified for oils and fluids mentioned in Section 692; provided, however, that an auxiliary tank of a capacity not exceeding ten gallons may be placed above the floor.

(b) Nothing in the provisions of this Article shall be construed as repealing any of the provisions of an ordinance for the storage of gasoline in the alleys of the city, passed by the City Council on the 11th day of March. A. D. 1907, pages 3456 to 3461, inclusive, of the Council Proceedings of said

date.

#### ARTICLE XXIII.

Billboards, Signboards, Signs, and Fences.

695. Billboards and Signboards on Buildings—Construction—Height.) No billboard or signboard shall be erected or placed upon or above the roof of any building or structure within the limits of the City of Chicago; and it shall be unlawful for any person, firm or corporation to attach any billboard or signboard to the front, sides, or rear walls of any building, unless the same shall be placed flat against the surface of the building and safely and securely anchored or fastened thereto in a manner satisfactory to the Commissioner of Buildings.

696. Size and Construction of Billboards and Signboards Erected Within Fire Limits Otherwise Than on Buildings.) The face of billboards or signboards erected within the fire limits as now defined or as they may hereafter be defined by ordinances of the hereafter be defined by ordinances of the City of Chicago, other than signboards and billhoards referred to in Section 698 hereof, shall not exceed twelve feet in height, and such not exceed twelve feet in height, and the same shall be constructed of galvanized iron or some other equally incombustible material, except that the stringers, uprights and braces thereof may be of wood. All such billboards or signboards shall be securely anchored or fastened so as to be safe and substantial.

697. Height and Distance From the Ground of Billboards and Signboards Erected Within the Fire Limits.) It shall be unlawful for any person, firm or corporation lawful for any person, firm or corporation to construct or erect any billboard or signconstruct or erect any billboard or significant except those specified in Section 698 hereof, within the fire limits of the City of Chicago at a greater height than fifteen feet six inches above the level of the adjoining street. Where the grade of the adjoining street, we street here with the control of the street here. joining street or streets has not been established, no billboard or signboard shall be constructed or erected at a greater height than fifteen feet six inches above the level of the ground upon which such billboard or signboard is erected. The face of every or signboard is erected. The face of every billboard or signboard within the fire limits shall be of incombustible material, but the supports and framework of the same shall be of wood. The base of the billboard or signboard shall, in all cases, be at least three feet six inches above the level of the adjoining street. If, however, the level of the ground where the billboard or signboard the ground where the billiography of significant is to be erected is above the level of the street, then the bottom of the face of the billboard or signboard must be at least three feet six inches above the level of the ground at the point where the board is to be ed. Every said billboard or signboard must be constructed and located in accordance with the provisions of this Article and shall be subject to the approval of the Commissioner of Buildings.

698. Wooden Billboards or Signboards-Construction—Size—Exceptions.) Billboards or signboards not exceeding twelve square feet in area may be built of wood or other combustible material, and such billboards or signboards shall be exempt from the provisions of this Article, except that they shall be safely and securely anchored or fastened and shall be so constructed, anchored and and shall be so constructed, anchored and fastened that they will withstand the wind pressure specified in Section 703 of this Article. It shall be unlawful to erret any such square feet in area before a permit therefor has been procured from the Commissioner of Buildings, the application for which must include the plans and specifications of such board and its supports and fastenings. No such board or boards shall be more than

Billboards and Signboards Erected side the Fire Limits—Construction—
e.) It shall be unlawful for any perfirm or corporation to construct, erect
locate any billboard or signboard, ex-Outside cept those specified in Section 698 hereof, outside the fire limits of Chicago at a greater feet six inches above Where oniside the fire limits of threago at a greater height than fifteen feet six inches above the level of the adjoining street. Where the grade of the adjoining street has not been established, no billboard or signboard shall be constructed or creeted at a greater height than fifteen feet six inches above the level of the ground upon which such billboard or signboard is erected. The base of the billboard or signboard shall, in all cases, The base of the billboard or signboard shall, in all cases, be at least three feet six inches above the level of the adioining street. If, however, the level of the ground where the billboard is to be erected is above the level of the street, then the bottom of the face of the billboard or signboard must be at least three feet six inches above the level of the ground at the point where the beard of the ground at the point where the board is to be erected. The braces, supports and face of the billboard or signboard outside the fire limits may be made of wood, unless the billhoard or signboard shall be erected or located so that any part of the face of said board is nearer than ten feet to any building or structure in which case the face of the same shall be constructed with in-combustible material. Every such billboard or signboard shall be safely and securely constructed, anchored, fastened and located in accordance with the provisions of article and shall be subject to the approval of the Commissioner of Buildings.

700. Provisions of This Article Shall Apply to Other Similar Structures.) The proply to Other Similar Structures.) The provisions of this article shall apply to other similar structures of like size and construction without regard to their use whether erected on or near the surface of the ground or anchored to, or fastened to any building or structure.

No Billboard or Signboard Shall be Erected Without Permit.) No billboard or signboard or other similar structure such as is described in this article shall be erected or maintained within the city unless a permit shall first have been secured by the person, firm or cornoration desiring to erect or maintain such billboard or signboard from the Commissioner of Buildings to whom application for such permit shall be made; and such application shall be accompanied by such plans and specifications of the proposed billboard or signboard and location of same as are necessary to fully advise and acquaint the said Commissioner with the construction of such proposed billboard or signboard. If the plans and specifications accompanying such application shall be in accordance with the provisions of this article, said Commissioner shall thereupon issue a permit for the erection of such billboard or signboard upon the payment by the applicant of a fee as hereinafter fixed.

702. Alteration and Repair of Billboards and Signboards.) No material alteration of any billboard or signboard nor removal from one location to another shall be made except upon a written permit issued by the Commissioner of Buildings authorizing such alteration or removal; and such permit shall be issued upon application in writing made to such Commissioner by the owner of such billboard or signboard or by the person in charge, possession or control thereof, accompanied by a plan of the proposed alterations or repairs to be made and a written statement covering the proposed removal from one location to another and its reconstruction in the new location, which said alteration and repairs or removal shall be made in accordance with the provisions of this article and the ordinances of the City of Chicago. Where such plans, specifications and location are in compliance with the requirements of this article and are satisfactory to and approved by the Commissioner of Buildings, such Commissioner shall issue a permit upon the payment of a fee therefor as hereinafter fixed; but such alteration shall not be construed to apply to the changing of any advertising matter of any billboard or signboard, nor the refacing of the framework supporting same.

703. Wind Pressure—Strength—Eillboards
Now Existing or Hereafter Constructed.)
All billboards and signboards now in existence, or hereafter to be constructed, erected
or maintained, shall be made, constructed,
erected and maintained of sufficient strength
to withstand a wind pressure of twenty-five
pounds per square foot of surface without
stressing the material beyond the safe limit
of stress given elsewhere in this chapter.

704. Changes in Existing Billboards and Signboards.) No surface billboard or signboard constructed or erected prior to the passage of this ordinance shall be maintained after six months from and after the passage of this ordinance where the height of such billboard or signboard exceeds seventeen feet, nor shall such billboard or signboard be maintained after such date, unless there is a clear space of at least three feet six inches above the level of the adjoining street. If, however, the level of the ground where the billboard or signboard is erected or maintained is above the level of the street then there must be a clear space of at least feet between the bottom or face of the billboard or signboard and the level of the ground at the point where the billboard or signboard is erected or maintained.

705. Duty of Commissioner—Owner's Name to Be Placed on Top of Billboard or Signboard—Annual Inspection.) It shall be the duty of the Commissioner of Buildings to inspect all plans and specifications submitted in connection with the erection or construction or the alteration or repair of any billboard or signboard and to approve same if the method of construction and provisions made for fastening, securing, anchoring and maintaining such billboard or signboards are such as will serve to protect the public and to render such billboards safe and substantial. It is further made the duty of the Commissioner of Buildings to exercise supervision over all billboards and signboards erected or being maintained un-

der the provisions of this article: and to cause inspection by inspectors in his department of all such billboards and signboards to be made once each year and oftener where the condition of such boards so require; and whenever it shall appear to said Commissioner that any such billboard or signboard has been erected in violation of this ordinance or is in an unsafe condition or has become unstable or insecure or is in such a condition as to be a menace to the safety or health of the public, he shall thereupon issue or cause to be issued a notice in writing to the owner of such bill-board or signboard or person in charge, possession or control thereof, if the whereabouts of such person is known, informing such person, firm or corporation of the violation of this ordinance and the dangerous condition of such billboard or signboard and directing him to make such alterations or repairs thereto, or to do such acts or things, as are necessary or advisable to place such billboard or signboard in a safe, substantial and secure condition and to make the same comply with the requirements of this ordinance within such reasonable time as may be stated in said notice. If the owner or person in charge, possession or control of any billboard or signboard when so notified any bindogram of significant which so have shall refuse, fail, or neglect to comply with and conform to the requirements of such notice, said Commissioner shall, upon the expiration of the time therein mentioned, alter, change, tear down or cause to be torn down such part of such billboard or signboard as is constructed and maintained in violation of this ordinance, and shall charge the expense to the owner or person in possession, charge or control of such billboard or signboard which shall be recovered from them by appropriate legal proceedings. If the owner of such billboard or signboard or the person in charge, possession or control thereof cannot be found, or his or their whereabouts cannot be ascertained, the Commissioner shall attach or cause to be attached to said billboard or signboard, a notice of the same import as that required to be sent to the owner or person in charge, possession or control thereof, where the owner is known; and if such billboard or signboard shall not have been made to conform to this ordinance and be placed in a secure, safe and substantial condition, in acwith the requirements of such notice, within thirty days after such notice shall have been attached to such billboard or signboard, it shall be the duty of the Commissioner of Buildings to thereupon cause such billboard or signboard or such portion thereof as is constructed and maintained in violation of this ordinance to be torn down; provided that nothing herein contained shall prevent the Commissioner of Buildings from adopting such precautionary measure as may be necessary or advisable in case of imminent danger in order to place such billboard or signboard in a safe condition, the expense of which shall be charged to and recovered from the owner of such billboard or signboard or person in charge, possession or control thereof in any appropriate proceedings therefor. No permit shall be issued to any applicant for permission to be issued to any applicant for permission to erect a billboard or signboard unless such applicant shall agree to place and maintain on the top of such billboard or signboard the name of the person or corporation owning same or who is in charge, possession or control thereof. It shall be the duty of the Commissioner of Buildings to require that the name of the person or corporation own the name of the person or corporation owning or in possession, charge or control of such billboard or signboard is placed upon such billboard or signboard forthwith upon the erection thereof and is kept thereon at all times such billboard or signboard is maintained; and in case the owner of such billboard or signboard or the person in

charge, possession or control thereof shall fail or refuse to place and maintain such name on the same, they shall be subject to the penalty hereinafter provided for. Every person, firm or corporation engaged in the business of erecting billboards or signboards for the purpose of display advertising shall file with the Commissioner of Buildings within ninety days after the passage of this ordinance a full and complete report of the location and size of all existing billboards or signboards.

706. Fees for Permits and Annual Inspection—Indemnifying Bond.) (a) The fee to be charged for permits issued for the erection or construction of billboards or signboards or for the alteration thereof shall be two (\$2.00) dollars for each twenty-five lineal feet of billboard or signboard erected or altered. An annual fee shall be charged every person, frm or corporation as owner, or in possession, charge or control of any billboard or signboard for inspection of such billboards or signboards, which shall be thirty-five (35) cents for each twenty-five lineal feet of billboard or signboard, or fractional part thereof.

(b) Every person, firm or corporation engaged in the business of constructing and erecting billboards or signboards shall file with the City Clerk a penal bond, with sureties to be approved by the Commissioner of Emildings, in the sum of twenty-five thousand (\$25,000.00) dollars, conditioned that such person, firm or corporation shall faithfully comply with all the provisions and requirements of this ordinance with respect to the construction, alteration, location and safety of billboards or signboards and for the payment of the inspection fee required by said ordinance; and conditioned, further, to indemnify, save and keep harmless said City of Chicago and its officials from any and all claims, damages, liabilities, losses, actions, suits or judgments which may be presented, sustained, brought or secured against the City of Chicago or any of its officials on account of the construction, maintenance, alteration or removal of any of said billboards or signboards, or by reason of any accidents caused by or resulting therefrom.

shall be unlawful for any person, firm or corporation to erect or construct any bill-board or signboard in any block on any public street in which one-half of the buildings on both sides of the street are used exclusively for residence purposes without first obtaining the consent in writing of the owners or duly authorized agents of said owners owning a majority of the frontage of the property on both sides of the street in the block in which such billboard or signboard is to be erected, constructed or located. Such written consents shall be filed with the Commissioner of Buildings before a permit shall be issued for the erection, construction or location of such billboard or signboard.

708. **Penalty.)** Any person, firm or corporation owning, operating, maintaining or in charge, possession or control of any bill-board or signboard within the city, who shall neglect or refuse to comply with the provisions of this article, or who erects, constructs or maintains any billboard or signboard that does not comply with the provisions of this article shall be fined not less than twenty-five (\$25,00) dollars nor more than two hundred (\$200.00) dollars for each offense; and each day on which any such person shall permit or allow any billboard or signboard owned, operated, maintained or controlled by him to be erected. constructed or maintained in violation of any of the provisions of this article shall constitute a separate and distinct offense.

709. Fences—Height of.) No wooden fence shall be constructed of greater height than eight feet above the sidewalk grade or eight feet above the surface of the ground where no grade is established.

710. Illuminated and Other Roof Signs of Steel Skeleton Construction—Definition—General Requirements—Fees.) (a) Illuminated and other roof signs regulated by this section shall be defined as signs constructed, erected and maintained upon or over the roof of any building, which have all or any part of its letters of which said signs may be constructed either in an outline of in-candescent lamps or which have painted, candescent lamps or which have painted, flush or raised letters where the face of the sign presents a surface to be affected by wind pressure not in excess of the requirements hereinafter contained; or signs having a border of incandescent lights attached the stream of respective light theory represents the stream of the s thereto and reflecting light thereon; or transparent glass signs where they are lighted by electricity or other illuminant. Every such sign as hereinabove described shall be constructed with steel skeleton construction so as to present a surface to be affected by wind pressure which shall not exceed fifty per cent. of the face of the sign. No illuminated roof sign shall be erected or maintained upon or over the roof of any building unless the framework thereof shall be entirely of metal or some other equally incombustible material, and no material, except such material as is used for insulating wires and conductors, which is less combustible than metal, shall be used in, on or about, or comprise a part of any illuminated roof sign, except that the material to which the framework of any such sign shall be anchored, may be substantial beams an-chored or securely fastened to the roof or walls of the buildings upon or over which any such sign is erected.

(b) The distance between the said building or structure and the lower edge of such sign shall not be less than five (5) feet. The height of any such sign from the roof of the building or structure to which the same is anchored or attached shall not exceed sixty (60) feet. No such sign, hereafter erected, shall be constructed closer than six (6) feet from the edge of the roof of the building or structure upon which same is creeted. No such illuminated roof sign shall be constructed on any building or which is over eight stories structure Any illuminated roof sign, less than height. Any illuminated roof sign, less than twelve (12) feet in height, shall be exempt from the provisions of this section and shall be held to be governed by the ordinances of the City of Chicago relating to billboards and signboards. No illuminated roof sign, and signboards. No illuminated roof sign, such as is described in this section, shall be constructed, erected, maintained or put in place until the person, firm or corporation desiring to construct, erect, maintain or put in place such sign shall have made application in writing to the Commissioner of Buildings for permission so to do, submitting with such application plans and specifica-tions showing the size, nature and construction of the sign proposed to be crected, and shall present to the City Electrician plans shall present to the City Electrician plans showing the insulation, location and construction of the electrical part of such sign. If the Commissioner of Buildings shall be of the opinion that such sign, if erected, constructed and maintained in accordance with the plans and specifications so submitted, shall be safe and secure, he shall approve the application so submitted, providing the plans bear the approval of the City Electrician, and the Commissioner of Buildings shall note his approval upon such plans and specifications and keep a or bundings shan note his approval upon such plans and specifications and keep a copy thereof at all times on file in his office. All signs shall be constructed, erected and maintained of sufficient strength to withstand a wind pressure of not less than

thirty pounds per square foot of surface without stressing the material beyond the safe limits of stress given elsewhere in this chapter. It shall be the duty of the Commissioner of Buildings to cause his building inspector or inspectors to make an inspection annually of each illuminated roof sign erected or constructed or being maintained under the provisions of this ordinance for the purpose of ascertaining whether such sign is safely and securely constructed and so anchored and fastened to the building or structure; provided, however, that the provisions of this section shall not apply to the erection, construction and maintenance of signboards and billboards as regulated by the ordinances of the City of Chicago.

- (c) Any person, firm or corporation desiring to erect or maintain an illuminated roof sign, as described in this ordinance, shall pay to the city, to cover the cost of the inspection and approval by the Commissioner of Buildings of the plans and specifications of such sign, when erected, a fee of fifty dollars (\$50.00) for the first five hundred (500) square feet of superficial area of such sign or fractional part thereof, and for each additional square foot two cents (2c). For each annual inspection by the Commissioner of Buildings subsequent the Commissioner of Bulldings subsequent to the first inspection there shall be paid a fee of fifty dollars (\$50.00) for each illuminated roof sign. In addition to the fees herein required to be paid for inspection by the Commissioner of Buildings, there shall be paid by the owner or person having charge or control of any illuminated roof charge or control of any illuminated roof sign, as herein described, an annual inspection fee to cover the cost of such inspection which shall be made by the City Electrician, and such fee shall be at the rate provided by the ordinances of Chicago.
- (d) Every illuminated roof sign erected, constructed or maintained under the provisions of this ordinance shall have the name of the owner thereof placed thereon in a legible and conspicuous manner. No person, firm or corporation shall be permitted to erect or maintain an illuminated roof sign unless he shall execute and file with the City Clerk of Chicago, with sure-ties to be approved by the Commissioner of ldings, a bond to the City of Chicago in penal sum of fifteen thousand dollars Buildings, a (\$15,000.00), conditioned to indemnify, save and keep harmless the City of Chicago, and damage officers and agents, from any which it. the said city, or any of said officers, may suffer, or from any costs, liability or expense of any kind whatsoever which it, the said city, or any of its officers, may be put to or which may be recovered against the said city or any of its officers, from or by reason of the construction, erection and maintenance of such sign, and conditional further to faithfully observe and perform the provisions and conditions of this ordinance and of any ordinance now in force or which may hereafter be passed by the City Council of the City of Chicago, relating to or governing the erection, maintenance, use or inspection of illuminated roof signs.
- (e) The permission and authority granted by this ordinance shall cease at any time hereafter at the discretion of the Mayor. In case of the termination of the privileges herein granted by the exercise of the Mayor's discretion as aforesaid, all such electrical signs erected by virtue of the authority conferred by this ordinance, shall be removed at the expense of the owner or owners of the building or the person, firm, corporation or individual who are then maintaining same without any cost or expense of any kind whatsoever to the City of Chicago, provided that in the event of the failure, neglect or refusal on the part of the owner of the building or structure upon which said illuminated electric sign is con-

structed or the person, firm, corporation or individual operating and maintaining said electric sign to remove said electric upon the revocation of the permit by Mayor as herein provided, the Commissioner of Buildings may proceed to remove same and charge the expense thereof to the owner of the building or structure upon which said illuminated electric sign is constructed or the person, firm, corporation or individual

operating or maintaining same.

(f) Any person, firm or corporation who shall erect, construct or maintain an illuminated roof sign in violation of any of the provisions of this section shall be fined not less than fifty dollars (\$50.00) nor more than two hundred dollars (\$200.00) for each of-

fense.

#### ARTICLE XXIV.

Frontage Consents.

- Definition of Word "Block" as Used is Chapter.) Whenever a provision is 711. in This Chapter.) made in this chapter that frontage consents shall be obtained for the erection, construction, alteration, enlargement or maintenance of any building or structure in any block, the word "block." so used, shall not be held to mean a square, but shall be held to em-brace only that part of a street bounding the square which lies between the two nearest intersecting streets, one on either side of the point at which such building or structure is to be erected, constructed, altered, enlarged or maintained, unless it shall be otherwise specifically provided.
- \*712. Frontage Consents—For What Required.) It shall be unlawful for any person, firm or corporation to locate, build, construct, or maintain on any lot fronting on any street or alley in the city in any block in which one-half of the buildings on both sides of the street are used exclusively for residence purposes, or within fifty feet of any such street, any building or place used for gas reservoir, packing house, rendering plant, soap factory, tannery, blacksmith shop, foundry, machine shop, factory or machine shop combined with a foundry, or laundry to be slop combined with a foundry, or latingry to be run by machinery, or livery stable, without the written consent of a majority of the property owners according to frontage on such street or alley. Such written consent shall be obtained and filed with the Com-missioner of Buildings before a permit is issued for the construction or alteration of any building or place for any of the above purposes; provided, that in determining whether one-half of the buildings on both sides of the street are used exclusively for residence purposes any building frenting upon another street and located upon a corner lot shall not be considered.

- \*Amended March 11, 1912. 712a. Frontage Consents—For What Required.) It shall be unlawful for any person, firm or corporation to locate, build or construct any store for the sale at retail of goods, wares and merchandise, on any street in any block in which all the buildings are used exclusively for residence pur-poses, without first securing and filing with the Commissioner of Buildings the written consent of a majority of the property owners according to frontage on both sides of the street in the block in which the building to be thus used is located; provided, in de-termining whether all the buildings in the said block are used exclusively for residence purposes, any building fronting upon an-other street and located upon a corner lot shall not be considered.
- 713. Reformatories—Sheltering Institu-tions.) (a) It shall be unlawful for any person, firm or corporation to build, construct, maintain, conduct or manage any formatory, rescue or sheltering institution in any block or square in which one-half of the buildings on both sides of the street or streets on which the proposed reformatory,

rescue or sheltering institution may front, are used exclusively for residence purposes without the written consent of a majority of the property owners, according to frontage on both sides of the streets bounding such block. Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction, alteration, or maintenance of such building.

(b) Provided. that in determining whether one-half of the buildings on both sides of the street are used exclusively for residence purposes, any building fronting upon another street and located upon a cor-

ner lot shall not be considered.

714. Fermit for Moving Frame Buildings - Requirements - Written Consents Must Be Obtained—Amdavits Made—space Occupied on Lot.) (a) Permits to move frame buildings shall be granted if any such frame building has not been damaged to an extent greater than fitty per cent. of its value by nre, decay, or otherwise. Any person deciving to make the control of siring to remove a trame building shall first obtain the written consent to such removal from persons owning a majority of the frontage of the lots on both sides of the street in the same block to which the building is to be removed. (b) Provided, however, that no permit shall be issued for the removal of any frame

building from any point outside the fire limits to any point within the fire limits when such building is of such a character that it would not be lawful to build it within the fire limits when such building is of a character that it would not be lawful to build it within the fire limits, nor for the removal of any frame building from any point within the fire limits to any other point within the fire limits, unless the person, firm or corporation desiring to remove same shall first obtain the written consent for such removal from the persons owning two-thirds of the frontage of the lots on both sides of the street in the block to which the building is to be moved. The space to be occupied on any lot used for residence or tenement house purposes shall comply with the previsions of Section 440 of this chapter.

(c) No frontage consent shall be required of any person, firm or corporation for removing a building upon his own premises and not going upon the premises of any other person, or upon any street, alley or other public place, in making such removal.

715. Amusements—Frontage Consents Required.) It shall be unlawful for any person, firm or corporation to construct or erect any building designed or intended to be used for the purpose of presenting or carrying on therein any entertainment for which a license is required by the ordinances of the City of Chicago without first obtaining the written consent of the property owners as required by the City ordinances.

#### \*716. Garages-Frontage Consents Required.)

It shall be unlawful for any person, firm or corporation to locate, build, construct or maintain any garage within two hundred feet of any building used as and for a hospital, church or public ing used as and for a hospital, church or public or parochial school, or the grounds thereof, and it shall be unlawful for any person, firm or cor-poration to locate build sentencing. poration to locate, build, construct or maintain any garage in the city in any block in which two-thirds of the buildings on both s des of the street thirds of the buildings on both sides of the street are used exclusively for residence purposes, or within one hundred feet of any such street in any such block, without securing the written consent of a majority of the property-owners, according to frontage on both sides of the street as provided by the ordinances of the City of Chicago.

Any person violating any of the provisions of this ordinance shall be fined not less than five dollars for each

lars nor more than one hundred dollars for each offense, and his license shall be subject to revoca-tion by the Mayor,

\*Re-passed July 17, 1911, in accordance with court decision, and Sec. 716, Code 1911, repeated.

711. Storage of Shavings and Sawdust in 11. Storage of Shavings and Shavings and Buildings Used for Residence Purposes.)
No person, firm or corporation shall keep, pile, store or accumulate loose shavings, excelsior, sawdust or other similar inflamments. mable materials in any quantity, nor shall any such materials in bales be stored in any quantity exceeding 2,000 pounds in any building used wholly or in part for residence purposes.

#### ARTICLE XXV.

Fire Limits.

\*718. Fire Limits—Provisional Fire Limins.) (a) The fire limits of the City of hicago, within which wooden buildings its.) (a) The nre min. which where sha Chicago, within which wooden buildings shall not be erected, shall be and they are hereby defined as follows: All that part of the City of Chicago bounded by the Iollowing limits: Commencing at the intersection of the shore of Lake Michigan and the center line of Devon avenue, thence west along the center line of Devon avenue to a line one hundred twenty-five feet west of the west line of North Clark street. of the west line of North Clark street, thence south along said line one hundred twenty-five feet west of the west line of North Clark street to the center line of Lawience avenue, thence west along the center line of Lawrence avenue to the center line of North Western avenue, thence south along the center line of North Western averue, thence south thence west along the center line of Addison street, thence west along the center line of Addison street, to the center line of North Whipple street, thence south along the center line of North Whipple street to the center line of North Whipple street to the center line of North Whipple street to the center line of Riston avenue, thence southeast along the street, thence south along the center line of North Whipple street to the center line of Fiston avenue, thence southeast along the center line of Eiston avenue to the center line of Roscoe street, thence east along the center line of Roscoe street to the center line of the North Branch of the Chicago River, thence southeasterly along the center line of the North Branch of the Chicago River to the center line of Belmont avenue, thence west along the center line of North Kedzie avenue to the center line of North Kedzie avenue, thence south along the center line of Diversey avenue, thence west along the center line of North Kedzie avenue to the center line of Diversey avenue, thence west along the center line of North Central Park avenue, thence south along the center line of North Central Park avenue, thence south along the center line of Fullerton avenue, thence west along the center line of Forth 44th avenue, thence south along the center line of North 44th avenue, thence south along the center line of North 44th avenue, thence south along the center line of North 44th avenue to the center line of North Austin avenue, thence south along the center line of North Austin avenue and South Austin avenue to the north line of North Austin avenue, thence south along the center line of North Austin avenue and South Austin avenue and the right-of-way of the Baltimore & Ohio Chicago Terminal Railroad Co., thence eastely along the north line of the right-of-way of the Baltimore & Ohio Chicago Terminal Railroad Co. to the center line of South 46th avenue, thence south along the center line of South 46th avenue to the center line of West 22nd street, thence east along the center line of South 46th avenue, thence east along the center line of South 44th avenue, thence south along the center line of South 44th avenue, thence south along the center line of South 44th avenue to the center line of South 44th avenue coast along the center line of West 33rd street, thence cast along the center line of West 33rd street, thence cast along the center line of West 33rd street. to the center line of West 33rd street, thence cast along the center line of West 33rd street to the center line of South 40th avenue, thence south along the center line of South 40th avenue to the center line of the Illinois and Michigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the center line of the Illinois and Wichigan Canal, thence northeasterly along the 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to the center line of West 43rd street, thence east along the center line of West 43rd street to a line one hundred twenty-five feet street to a west of the west line of South Ashland avenue, thence north along said line one hundred twenty-live feet west of the west line of South Ashland avenue to the center line of West 41st street, thence east along the center line of West 41st street to the center line of South Ashland avenue, north along the center line of South Ashland avenue to the center line of West 40th Street, thence east along the center line of West 40th street to a line one hundred twenty-five feet east of the east line of South Ashland avenue, thence south along said line one hundred twenty-five feet east of the east line of South Ashland avenue to the center line of West 43rd street, thence west along the center line of West 43rd street to the center line of South Ashland avenue, thence south along the center line of South Ashland avenue to the center line of West 47th street, thence east along the center line of West 47th street to a line one hundred twenty-five feet west of the west line of South Heletzel street themes gotth line of South Halsted street, thence south along said line one hundred twenty-five feet west of the west line of South Halsted street to the north line of West 51st street, thence east along the north line of West thence east along the north line of West 51st street to a line one hundred twenty-five feet east of the east line of South Halsted street, thence north along said line one hun-dred twenty-five feet east of the east line dred twenty-five feet east of the east line of South Halsted street to the center line of West 43rd street, thence east along the center line of West 43rd street to the center line of Wallace street, thence north along the center line of Wallace street to the center line of West 40th street, thence east along the center line of West 40th street to the center line of Butler street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street to the center line of West 42rd street street street to the center line of West 42rd street to the center line of West 43rd street. thence east along the center line of 43rd street to a line one hundred twenty-five feet west of the west line of Wentworth avenue, thence south along said line one hundred twenty-five feet west of the west line of Wentworth avenue to the north line of West Garfield boulevard, thence east along the north line of West Garfield boulevard to a line one hundred twenty-five feet east of the east line of Wentworth avenue, thence north along said line one hundred twenty-five feet east of the east line of Wentworth avenue to the center line of West 43rd street, thence east along the center line of West 43rd street to a line one hundred twenty-five feet west of the west line of South State street, thence south along said line one hundred twenty-five feet west of the west line of South State street to the center line of South State street to the center line of West Garfield boulevard, thence west along the center line of West Garfield boulevard to the center line of Union avenue, thence north along the center line of West 51st street, thence west along the center line of South Centre avenue, thence south along the center line of South Centre avenue, thence south along the center line of South Centre avenue. north along said line one hundred twentyalong the center line of South Centre avenue of the north line of West 63rd street, thence west along said line one hundred twentywest along said line one maintenance of the five feet north of the north line of West 63rd street to the center line of South Ashland avenue, thence south along the center line of South Ashland avenue to a line one hundred twenty-five feet south of the south line of West 63rd street, thence east along said line one hundred twenty-five feet south of the south line of West 63rd street to the center line of South Centre avenue, thence south along the center line of South Centre avenue to the center line of West 75th street, thence east along the center line of West 75th street and East 75th street to the center line of South Shore avenue. southeasterly along the center line of South Shore avenue to the center line of East 79th street, thence east along the center line of East 79th street to the center line of Ontario avenue, thence south along the center line of Cast 83rd street, thence east along the center line of East 83rd street to the center line of East 83rd street to the center line of Superior avenue, thence south along the center line of Superior avenue, thence south along the center line of East 89th street, thence west along the center line of East 89th street, thence west along the center line of Manistee avenue, thence south along the center line of Manistee avenue, thence south along the center line of Manistee avenue, thence south along the center line of Manistee avenue produced) to the northeasterly line of the right-of-way of the Lake Shore and Michigan Southern Railroad Co., thence south-easterly along the northeasterly line of the right-of-way of the Lake Shore and Michigan Southern Railroad Co., to the center line of East 95th street, to the South Chicago branch of the Pittsburgh, Fort Wayne & Chicago Railroad Co., thence southeasterly and southwesterly along the South Chicago branch of the Pittsburgh, Fort Wayne & Chicago Railroad to the center line of East 106th street to a line two hundred feet east of the east bank of the Calumet River, thence northerly along said line two hundred feet east of the east of the east bank of the Calumet River, thence northerly along said line two hundred feet east of the east of the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, thence cast along the center line of East 95th street, th

(b) Also, commencing at the intersection of the shore of Lake Calumet and the center line of Stony Island avenue, thence north along the center line of Stony Island avenue to the center line of Stony Island avenue to the center line of East 95th street, thence west along the center line of East 95th street to the center line of South Park avenue, thence south along the center line of South Park avenue produced to the center line of East 103rd street, thence east along the center line of Corlisa avenue to the center line of Corlisa avenue to the center line of Corlisa avenue to the center line of East 105th street, thence west along the center line of East 105th street, thence west along the center line of Cottage Grove avenue, thence southwesterly along the center line of Cottage Grove avenue, thence southwesterly along the center line of East 105th street to the center line of East 115th street to the center line of East 115th street, thence east along the center line of East 115th street, thence east along the center line of Calumbast Information of the right-of-way of the Michigan Central Railroad Co., thence southeasterly along the northeasterly line of the right-of-way of the Michigan Central Railroad Co., to the center line of East 127th street, thence east along the center line of East 127th street, thence east along the center line of East 127th street, thence east along the center line of East 127th street to the shore of Lake Calumet, thence northerly along the shore of Lake Calumet, thence northerly along the shore of Lake Calumet, thence hortherly along the shore of Lake Calumet to Stony Island avenue, the place of beginning.

(c) Excepting the district bounded as follows: Commencing at the intersection of the center line of Belmont avenue and the center line of the North branch of the Chicago River, thence east along the center line of Belmont avenue to the center line of Southport avenue to the center line of Southport avenue to the center line of Fullerton avenue to the center line of Fullerton avenue, thence west along the center line of the North branch of the Chicago River, thence northwesterly along the center line of the North branch of the Chicago River to the center line of Belmont avenue, the place of beginning.

(d) Excepting, also, so much of the land from which clay has been removed and in which filling has been placed in the district bounded as follows: Commencing at the intersection of the center line of Addison

street and the center line of North Western avenue, thence south along the center line of North Western avenue to the center line of Belmont avenue, thence west along the center line of Belmont avenue to the center line of the North Branch of the Chicago River, thence northerly along the center line of the North branch of the Chicago River to the center line of Addison street, thence east along the center line of Addison street to the center line of North Western avenue, the place of beginning.

the place of beginning.

(e) Excepting, also, the following territory, which shall be known as a provisional fire limit: Commencing at the intersection of the shore of Lake Michigan and the center line of hast 79th street, thence west along the center line of East 79th street to the center line of South Shore avenue, thence northwesterly along the center line of South Shore avenue, thence northwesterly along the center line of East 75th street to the center line of South Shore avenue to the center line of East 75th street, thence west along the center line of South State street, thence north along the center line of South State street to the northwesterly line of the right-of-way of the Lake Shore & Michigan Southern Railroad Co., thence southeasterly along the northwesterly line of the right-of-way of the Lake Shore & Michigan Southern Railroad Co. to the center line of East 67th street to the center line of South Park avenue, thence north along the center line of South Park avenue to the center line of East 63rd street, thence east along the center line of Cottage Grove avenue, thence south along the center line of Cottage Grove avenue, thence south long the center line of Cottage Grove avenue, thence south slong the center line of Cottage Grove avenue, thence south long the center line of Cottage Grove avenue, thence south long the center line of Cottage Grove avenue, thence south slong the center line of Cottage Grove avenue, thence south slong the center line of Cottage Grove avenue, thence south slong the center line of Cottage Grove avenue, to the center line of East 67th street to the shore of Lake Michigan, thence southerly and south-easterly along the shore of Lake Michigan to the place of beginning.

(f) The following district outside of the above described fire limits is hereby established as a provisional fire limit district. Commencing at the intersection of the center line of Stony Island avenue and the center line of East 75th street, thence south along the center line of Stony Island avenue to the center line of East 75th street, thence east along the center line of Fight street, thence east along the center line of Jeffrey avenue, thence north along the center line of Jeffrey avenue to the center line of Jeffrey avenue to the center line of Last 75th street, thence west along the center line of East 75th street to the center line of Stony Island avenue, the place of beginning.

(g) Any person desiring to erect a frame or wooden building to be used for residence or mercantile purposes within the provisional fire limits above described snall have a right to do so, upon presenting a petition to the Commissioner of Buildings together with a plat, plans and specifications showing the place where such building is to be erected. Such petition shall be verified by the affidavit of the applicant and shall contain the written consent of the owners of a majority of the frontage upon both sides of the streets surrounding the square in which the building is to be erected.

(h) No frame or wooden residence or mercantile building shall be erected within the said provisional fire limits exceeding forty feet high.

\*Amended July 22, 1912 (new ordinance).

719. Nuisance.) (a) Every building or structure constructed or maintained in violation of this chapter, or which is in an unsanitary condition, or in an unsafe or dangerous condition or which in any manner endangers the health or safety of any person or persons, is hereby declared to be a public nuisance.

(b) Every building or part thereof which is in an unsanitary condition by reason of the basement or cellar being damp or wet, or by reason of the floor of such basement

or cellar being covered with stagnant water, or by reason of the presence of sewer gas, or by reason of any portion of a building being infected with disease or being unnt for numan habitation or which by reason of any other unsanitary condition, is a source of sickness, or which endangers the public health, is hereby declared to be a public nuisanse.

720. **Penalty.)** Any person, or corporation who violates, neglects or refuses to comply with, or who resists or opposes the enforcement of any of the provisions of this chapter, shall be fined not less than twenty-live nor more than two hundred dollars for each offense, and every such person or corporation shall be deemed guilty of a separate offense for every day on which such violation, neglect or refusal shall continue; and any builder or contractor who shall construct any building in violation of any of the provisions of this chapter, and any architect designing, drawing plans for or having charge of such building or who shall permit it to be constructed, shall be liable to the penalties provided and imposed by this section.

Without Certificate from City Officials.) No license shall be issued to any person, nrm or corporation to produce, present, conduct, operate or offer for gain or profit, any theatricals, shows or amusements until the Commissioner of Buildings, the Commissioner of Health, the Fire Marshal and the City Electrician shall have certified in writing that the room or place where it is proposed to produce, present, conduct, operate or offer such theatricals, shows or amusements complies in every respect with the ordinances of the City of Chicago.

722. Lighting—Buildings Kept Lighted During Performance.) Every portion of any building or structure in which theatricals, shows and amusements are oftered, operated, presented or exhibited for gain or profit devoted to the use or accommodation of the public, and all outlets therefrom leading to the street, including all open courts, corridors, stairways, exits and emergency exit stairways shall be well and properly lighted during every performance, and shall remain lighted until the entire audience has left the premises. It shall be the duty of the Fire Marshal to enforce the provisions of this section.

723. Independent Lighting Systems for Exits.) All stairways and corridors in every building or structure in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, shall be supplied with a supplemental lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building or structure and shall be in operation during the entire period that such building or structure is open to the public and until the entire audience has left the building.

The word "Exit" shall appear in letters at least six inches high over the opening of every means of egress from such building or structure, and a red light shall be kept burning over such sign.

It shall be the duty of the City Electrician to enforce the provisions of this section relative to the installation of the lighting provisions contained therein; and it shall be the duty of the Fire Marshal to see the lights are kept lighted as required by this section.

724. Gas Calcium Lights Prohibited—Arc Lights.) The use of gas calcium lights in any building in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, is hereby prohibited.

All are lights used on the stage shall be subject to the approval of the City Electrician.

Exit Doors or Gates Not to be Locked—Unstructions Fromuted.) No exit door or gate in any place in which theatricals, snows and amusements are offered, operated, presented or exhibited for gain, shall be locked or fastened in any manner during the entire time that such place of amusement is open to the public.

All aisles, passageways, corridors and exits of ail such places of amusement shall be kept free from camp stools, chairs, sofas, draperies and other obstructions, and no person shall be allowed to stand in or occupy any of such alsies, passageways, corridors or exits during any performance.

Diagram of Exits and Seats.) shall be the duty of the owner, lessee or manager of any theater having a seating capacity in excess of 300 persons, to cause to be printed on all programs turnished for any performance, on the page opposite to that upon which the cast is printed, a diagram showing conspicuously the place of every exit from such building. A diagram of the floor plan showing the location of every seat on each floor, and also the exits leading from each floor, drawn to a scale of one-eighth of an inch to the foot, shall be posted in a conspicuous place in the box office of any such theater, so as to be easily seen by the public. It shall be the duty of the Fire Marshal to entorce the provisions or this section.

727. Any person, firm or corporation violating any of the provisions of this ordinance shall be fined not more than two hundred dollars for each offense, and each and every day upon which any such person, firm or corporation shall give, conduct, produce, present, offer or operate any such entertainment contrary to or in violation of any of the provisions of this ordinance shall constitute a separate and distinct offense.

Section 8. This ordinance shall be in full force and effect from and after its passage, approval and due publication. Passed Dec. 5th, 1910.

#### AN ORDINANCE

Concerning special stage firemen and fire guards in theatres having a seating capacity for three hundred or more persons.

[Inserted as Sections 931 to 939, inclusive, in The Chicago Code of 1911.1

#### Be it ordained by the City Council of the City of Chicago:

Section 1. Special Stage Firemen Fireguards Required.) It shall be the duty of every person, firm or corporation conducting, operating or maintaining any room in a building which is used regularly for theatrical or vaudeville purposes and where an admission fee is charged and having a seating capacity for three hundred or more persons, to procure and keep at his, their or its own expense one adult male person a special stage fireman and one adult male person as a fireguard who shall wear such uniform and badge as the Fire Marf the City of Chicago may pre-Such special stage fireman shall be υť responsible to and under the direction and subject to the control of said Fire Marshal or his accredited representative during such time as any such theatre may be open to the public. Such special stage fireman shall be kept on duty by every such person, firm or corporation at every such building conducted by him, them or it as aforesaid at least thirty minutes prior to the commencement of any performance, during the entire time of such performance and until the entire audience shall have left the building.

Section 2. Duties of Special Stage Firaman.) It shall be the duty of such special stage fireman to see that all fire appliances on the stage and above and below, it, in the dressing rooms and throughout the basement of any such building used as a theatre, are in their proper places and in good working order; that the tanks supplying the standpipes and the sprinkling system are full of water, that the ventilator above the stage and other ventilation apparatus used in connection with the theatre are in operain connection with the theatre are in opera-tion and in good working order and chang-ing the air, as required by the ordinances of the city. Such special stage fireman shall make daily reports, in duplicate, in such manner and form as said Fire Marshal shall prescribe, which report shall be counter-signed by the irreguard. The original of the aforesaid report shall be delivered to the Fire Marshal of the City of Chicago and the duplicate thereof shall be delivered to the owner of the theatre, where such special stage fireman is employed, or to the person having the management thereof. Said special stage fireman shall be subject to the orders of the Fire Marshal during such time as the theatre shall be open and occupied by the public.

Section 3. Fireguard—Duties.) It shall be the duty of such fireguard to see that all exit doors are unfastened and unobstructed, that the aisles are kept clear and tree from all obstructions and that all the provisons of the ordinances of the City of Chicago relating to theatres are observed and complied with. Such fireguard may, in the discretion of the owner or manager of the theatre wherein he is employed, act as chief usher or auditorium superintendent during performances.

Monthly Report to Fire Mar-Section 4. shall) It shall be the duty of such special stage fireman and fireguard to report in person to the Fire Marshal or his accredited representative, at least once in each month, and they and each or them shall be subject to, and required to obey such rules and regulations as the Fire Marshal shall prescribe governing the duties to be performed by them in conformity with this ordinance; provided, however, that such rules and regulations shall apply to an special stage nremen and hreguards.

5. Interpretation.) This ordi-Section nance shall not be so construed as to prevent the owners or managers of theatres employing special stage firemen or fireguards from assigning such persons so employed to duties other than those enumerated in this ordinance when the theatre is not open to the public.

Section 6. Duties of Fire Marshal-License—Revocation.) Said Fire Marshal shall cause all such theatres to be inspected daily by a proper officer of the Fire Department, and he shall also examine all persons who desire to seek employment as special stage firemen or fireguards, as to their qualifications and fitness for the duties for which they seek to be employed, and whenever said Fire Marshal finds any such applicant to be competent, he shall, without charge, issue a license to such applicant and he may revoke any such license issued by him at any time, when in his judgment such special stage fireman or fireguard is incompetent, inefficient or has neglected to perform the duties required of him in this ordinance, wavided because the first Electrical Section 1988. ordinance; provided, however, that said Fire Marshal shall not revoke any license without giving to the person to whom such license was issued a reasonable opportunity to be heard on the subject of such revocation.

It shall be unlawful for any person, firm or corporation to employ a person either as special stage fireman or as a lireguard unless such person is needed as provided in this ordinance.

Section 7. Fire Apparatus.) In every building or place having a seating capacity of less than 300, in which theatricals, shows and amusements are offered, operated, presented or exmbited for gain, there snall be provided and kept upon the stage, two hand water pumps, two hire axes, two pike poles, and also one hand water pump in the basement or other portion of the building or place used as a dressing room or rooms; also one hand water pump and one fire axe in the auditorium thereof.

In every building or place having a seating capacity in excess or three hundred persons in which theathcais, shows and amusements are offered, operated, presented or exhibited for gain, there snall be kept two or more portable fire extinguishers on the stage and two or more portable fire extinguishers under the stage, which shall all times be kept filled with water; also four fire axes, two 15-100t pike poles and two 10-100t pike poles on each tier or floor of the stage.

Section 8. Fire Apparatus to be Under Control of Fire Department.) All stand-pipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, interpreted proscenium curtains, switch boxes, ventilators, controlling levers, axes, pike poles and all apparatus for the extinguishing of fire or guarding against fire shall be kept at all times in a condition satisfactory to and under the control of the Fire Marshall.

Section 9. **Penalty.)** Any person, firm or corporation who violates, neglects or recuses to comply with the provisions of this ordinance shall be fined not less than twenty-hve (\$25.00) dollars nor more than two hundred (\$200.00) dollars for each offense, and every such person, firm or corporation shall be deemed guilty of a separate offense for every day that such violation, neglect or refusal shall continue and any proprietor of a theatre who shall have violated any of the provisions of the foregoing sections, shall in the discretion of the Mayor on recommendation by said Fire Marshal, have his, their or its license to conduct, operate or maintain such theatre revoked.

Section 10. This ordinance shall be in full force and effect from and after its passage, approval and due publication.

Passed Dec. 5th, 1910.

#### STABLING HORSES.

(A health-measure provision passed December 12, 1910.)

#### AN ORDINANCE,

Prohibiting the construction or maintenance of any building for stabling ten or more horses within one hundred feet of any school, church, hospital, public park or public playground.

Be it ordained by the City Council of the City of Chicago:

Section 1. That it shall hereafter be unlawful for any person, firm or corporation to locate, build, construct or maintain any building or structure for stabling or keeping of ten or more horses within a distance of one hundred (100) feet from any school, church, hospital, public park or public playground.

Section 1 is included in Code 1911 as paragraph c. Section 616.

Section 2. Any person, firm or corporation violating any of the provisions of the toregoing section shall be fined not less than twenty-five dollars (\$25.00) nor more than two hundred dollars (\$200.00) for each offense.

Section 3. This ordinance shall be in full force and effect from and after its passage, approval and due publication.

#### ORDINANCE CONCERNING GARAGES.

Be it ordained by the City Council of the City of Chicago:

Section 1. No person, firm or corporation shall keep, conduct or operate a garage in this city without first obtaining a license so to do in the manner hereinafter provided, and it shall not be lawful for any person, firm or corporation to locate, build, construct or maintain any garage within two hundred feet of any building used as and for a hospital, church, or public or parochial school or the grounds thereof, nor shall any person, firm or corporation locate, build, construct or maintain any garage in the city in any block in which two-thirds of the buildings on both sides of the street are used exclusively for residence purposes or within one hundred feet of any such street in any such block, without the written consent of a majority of the property owners according to frontage on both sides of the street.

Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction of any such building; provided, that in determining whether two-thirds of the buildings on both sides of such street are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot shall not be considered; and provided, further, that the word "block," as used in this section, shall not be held to mean a square but shall be held to embrace only that part of the street in question which lies between the two nearest intersecting streets, one on either side of the lot on which said garage is to be located, built, constructed or maintained.

Section 2. Any person desiring to keep, conduct or operate a garage shall make application to the Mayor on a form to be provided by the City Collector. Such application shall set forth the name of the applicant, and, if an individual or individuals, the place of his or their residence, and, if a corporation, the names of the officers and their places of residence. Such application shall also contain the location of the place at which it is intended to keep such garage and the number of vehicles to be kept in such garage for the purpose of letting for hire or reward, together with a description of the style or type thereof. The Mayor shall thereupon issue or cause to be issued a license upon the payment by such applicant to the City Collector of a license fee in accordance with the rates hereinafter fixed.

Section 3. For all garages where vehicles are kept ready for use and where rent is paid to the keeper thereof for such keeping, or where vehicles are kept to be let out for hire or reward, or where vehicles are kept ready for use and where rent is paid to the keeper thereof and where vehicles are kept to be let out for hire or reward, the license fee shall be twenty-five dollars per annum.

Section 4. All such licenses shall expire on the thirty-first day of December following the date of issue, and, when issued for a period of more than six months, the license fee shall be the full annual license fee prescribed in the foregoing section. When issued for a period of less than six months, the license fee shall be one-half of the annual fee prescribed in the foregoing section.

If such garage keeper shall at any time, before the expiration of any license issued to him under the provisions of this article, change his place of business, he shall forthwith give notice of such fact to the City Collector.

Section 5. Any person violating any of the provisions of this ordinance, shall be fined not less than five dollars nor more than one hundred dollars for each offense, and his license shall be subject to revoca-

tion by the Mayor.

Section 6. That Sections 2684 and 2685 of The Chicago Code of 1911, adopted March 13, 1911, and all ordinances and parts of ordinances conflicting with this ordinance be and the same are hereby repealed.

Section 7. This ordinance shall take effect from and after its passage and due publication.

Passed July 17, 1911.

AN ORDINANCE AMENDING SECTION 1220 OF THE CHI-CAGO CODE OF 1911.

Be it ordained by the City Council of the City of Chicago:

Section 1. That Section 1220 of The Chlcago Code of 1911, be and the same is hereby amended so as to read as follows:

Location of Hospital near School or Playground.) No hospital of any kind or description shall hereafter be erected or established within four hundred feet of any properry used for public or parochial school purposes or as a fublic flayground,

#### AN ORDINANCE

Requiring that every portion of a moving picture theatre shall be lighted during exhibitions.

Be it ordained by the City Council of the

City of Chicago:

Section I. Every portion of a moving picture theatre, including exits, courts and corridors, devoted to the use or accommodation of the public, shall be so lighted by electric light during all exhibitions and until the outing addisons here latt the progress. the entire audience has left the premises the entire audience has left the premises that a person with normal eyesight snall be able to read Snellen Standard Test Type 40 at a distance of twenty feet and Type 30 at a distance of 10 feet; normal eyesight meaning ability to read Type 20 at a distance of 20 feet in daylight. Cards showing Types 20, 30 and 40 should be displayed in the corridor of every such theater facther the corridor of every such theatre together with a copy of this ordinance.

Section 2. Any person, firm or corpora-tion who violates, neglects or refuses to comply with, or who resists or opposes the enforcement of this ordinance shall be fined not less than twenty-five dollars nor more than two hundred dollars for each offense, every such person, firm or corporation shall be deemed guilty of a separate offense

for every day on which such violation, neglect or refusal shall continue. Section 3. This ordinance shall be in full force and effect from and after the first day of January, 1913. Passed July 22, 1912.

#### AN ORDINANCE

Declaring theatres located above the first floor of buildings nuisances. Be it ordained by the City Council of the

City of Chicago: Section 1. That it shall be and it hereby declared to be a nuisance to conduct a public theatre in a room located on any floor above the first floor level of a building of other than fireproof construction or a building which did not comply with the building which did not comply with the ordinances of the City of Chicago with reference to fireproof construction in force at the time such building was built, and that

all such public theatres now being conducted in rooms on any floor above the first floor level of a building of other than fire-proof construction or a building which did not comply with the ordinances of the City of Chicago with reference to fireproof constructions for the city of the conduction of the city of struction in force at the time such building was built, with a seating capacity of than three hundred, shall be and they hereby declared to be nuisances; and it shall be unlawful to continue to use such rooms for public theatrical purposes whether the same are equipped with a stage and scenery or are used for moving picture shows only.

The provisions of the foregoing paragraph shall not apply where the theatre is attered so as to bring the main audience room on the first floor level and slow-burning construction is used in the reconstruction and in making such alterations and all requirements of the ordinances of the City applying to Class IVb are compiled with, nor shall said provisions apply where the following conditions are fully complied with:

The building shall be used for (a) theatre purposes only.

The seating capacity shall not ex-(b) ceed the seating capacity at the time of passage of this ordinance.

Metal scenery only shall be used; provided, however, one proseenium drop, one back drop and three borders may be used provided they are of asbestos cloth subject to the approval of the Fire Marshal.

All seats shall be at least eighteen (d) inches wide and spaced thirty-two inches from back to back.

(e) There shall be no boxes, stalls or loges.

(f) No stove or furnace heating shall be allowed.

(g) All lighting shall be by electricity; provided, however, that gas may be used in connection with exit lights.

(h) At least sixty inches of exit space shall be provided for every one hundred seats.

The stage shall not be more than twenty-two feet from front to rear.

(j) The audience room shall be surrounded by brick walls.

(k) In all cases where dressing rooms are placed back of the stage the brick wall shall extend between the stage and such dressing rooms, but the stage wall may contain a door leading to such dressing room located behind said wall.

(1) All dressing rooms shall have in-combustible partitions and all existing wooden partitions, wherever located, shall be removed.

(m) There shall be an open space on at least three sides of the building containing such theatre, except as otherwise herein provided, which space shall be open from the floor level of the auditorium to the sky.

(n) One of such open spaces must be public street and the others public or (n) private alleys or open spaces leading di-rectly to a street or public or private alley, and in all cases where such open space is private ground, it must be at least five feet wide where the seating capacity does not exceed six hundred, and six inches additional width must be provided for each one hundred seats installed in such theatre in excess of six hundred; provided, however, that in all cases where a sprinkler system is installed over the stage, together with an approved power pump and pressure tank subject to the approval of the Fire Marshal, it shall be sufficient if there are open spaces as above required on two sides of the building in which such theatre is located.

Wherever the side of an audience room adjoins an open space, as herein-above required, which open space is on private ground or is a private or public alley, there shall be a five-foot open iron aney, there shall be a five-foot open from platform extending the entire length of the audience room, with an open iron stairway leading to the ground from said platform at each end thereof, and in all such cases there shall be a stairway fire escape leading from the gallery of the theatre if there is a gallery to such theatre, if there is a gailery, to such platform.

(p) Where the only open space adjoining the side of the audience room is a public street, there shall be a five-foot stairway, enclosed by walls of incombustible material, leading from the middle of the audience room on the side contiguous to such street to the first floor, at the bottom of which stairway there shall be an exit opening directly to the street, and in such cases there shall be a three-foot stairway leading from the gallery, if there is a gallery, to the main floor of the auditorium, the bottom of which shall be within ten feet of the stairway leading from such main floor to the ground floor.

(q) There shall be an exit at least five feet wide on each side of the stage, which exit shall lead through a passageway constructed entirely of incombustible material to a stairway which shall be completely enclosed with incombustible material. Said stairway shall lead to the ground level and communicate through a passageway of incombustible material directly with a public street or alley or a private alley which leads directly to a public street or alley.

(r) An exit shall be provided on each side of the balcony or gallery at the end nearest the stage by means of a stairway of incombustible material leading to the main floor of the audience room.

The exits at the front of the theatre shall communicate with stairways of incombustible material leading directly to

the other publications of the Ordinance.

passed by the City Council, including all of their mistakes.

the ground level and either opening directly out upon the street or communicating with the street through fireproof passageways, and in no case shall any stairway leading from the main audience floor to the ground level communicate or connect with any other such stairway.

(t) All doors leading through the pros-cenium wall or from the stage to the dressing rooms shall be of incombustible material.

(u) All alterations made in buildings containing such theatres shall be of slowburning construction, except as herein otherwise provided.

Section 2. Any person, firm or corporation that shall violate any of the provisions of this ordinance shall be fined not less than twenty-five (\$25.00) dollars nor more than two hundred (\$200.00) dollars for each of-fense, and each day's operation contrary to this ordinance shall be considered a distinct and separate offense.

Section 3. This ordinance shall take effect and be in force from and after its passage and due publication.

Passed July 22, 1912.

#### ORDINANCE LIMITING LOCATION OF HOSPITALS.

Be it ordained by the City Council of the City of Chicago:

Section 1. That Section 1220 of The Chicago Code of 1911 be and the same is here-

cago Code of 1911 be and the same is necessary amended so as to read as follows:

"1220. (Location of Hospital near School or Playground.) No hospital of any kind or description shall hereafter be erected or established within four hundred feet of any property with the property with the school of the same property with erty used for public or parochial school purposes or as a public playground."
Szcriox 2. This ordinance shall take effect and be in force on and after its passage

The legal Ordinance is the one

and due publication.

Passed April 29, 1912.

NOTE-In order to insure absolute accuracy and certainly correct legal designation, the editors of the Handbook have exercised every possible care in the presentation of the Building Ordinances, the copy being carefully checked over direct from the official minutes of the City Council, and presented exactly as passed. Architects will find that sections and paragraphs are correctly designated or numbered, which is not the case with some of

Several Ordinances pertaining to Buildings will be found at the end of the Building Ordinance on pages 153, 154 and 155. These Ordinances have to do with ERECTION AND LOCATION OF BUILDINGS, and have no special section numbers.

No expense has been spared to prepare what we believe to be a complete and comprehensive index of the Ordinance. Instead of following the old system of indexing each classification separately, we have provided one index to cover the entire Ordinance, which will doubtless prove more convenient than the former method.

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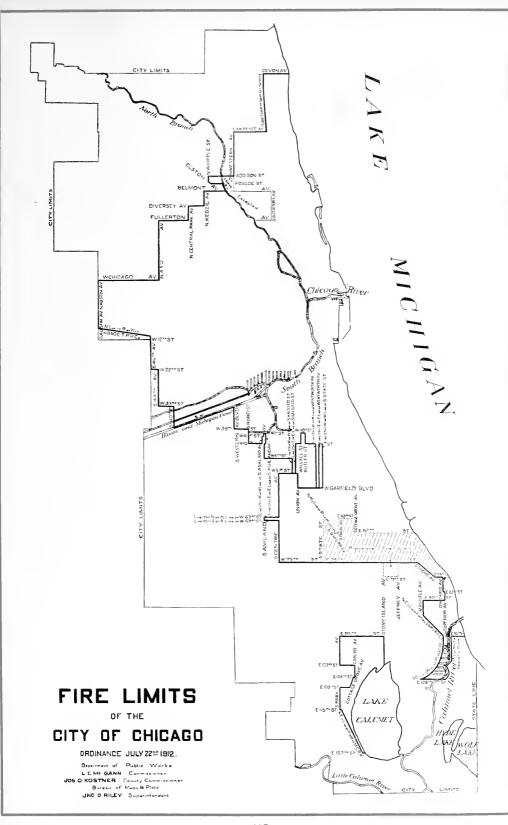
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# WHITE CITY ELECTRIC COMPANY ELECTRICAL CONTRACTORS

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## ELECTRICAL WORK

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### ELECTRICAL CONTRACTORS, MANUFACTURERS AND ENGINEERS

WE INSTALL—Power and Light Plants, Generators and Motors, Electric Light and Power Wiring for Factories, Churches, Schools, Colleges, Theatres, Offices, Stores and Residences,

Estimates cheerfully furnished for this class of work in any part of the United States.

WE MANUFACTURE—Switchboards, Panelboards, Steel Cutout Cabinets, Junction. Boxes, Service Switch Boxes, Theatre Stage Plugs, Experimental Switchboards and Appliances for High Schools and Colleges.

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Branch, MILWAUKEE, WIS., Tel. Grand 613

# We only want the electric wiring

which is given out by architects and owners who consider the best that can be done none too good.

An organization of experts such as we employ, necessitates our charging what good work is worth, but if we get the job we do it right.

### KOHLER BROTHERS

Contracting Electrical Engineers

343 So. Dearborn Street

**CHICAGO** 

### DEPARTMENT OF ELECTRICITY.

#### CITY OF CHICAGO.

#### NOTICE.

Particular attention is called to the different sections of the ordinance herein printed. Permit must be obtained before any work is done.

The use of electric current is prohibited previous to certificate or current permit being issued.

Conditions unsafe to life or property must be corrected within forty-eight hours.

Each building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb, except where the service wires are placed in conduits complying with the rules of the department of electricity; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk, except where such conduits are used.

Temporary work must be inspected and approved before current is used.

Alterations to existing wiring must not be made without regular permit,

Permits issued by the Commissioner of Public Works for electrical work to be done on streets must be countersigned by the City Electrician.

Violation of any of the Sections of this ordinance constitutes a misdemeanor and renders any person, firm or corporation liable to arrest and fine of not less than \$50 or more than \$100, also the cutting off and stopping of current used in violation until the provisions are complied with.

lay Talmer.

City Electrician.

### SPECIAL SUGGESTIONS TO ARCHITECTS.

The Department of Electricity will not allow more than twelve (12) sockets to be attached to one circuit.

Architects are urged to make definite specifications for electrical work, for the benefit of both the electrical contractor and the fixture contractor, specifying the number of outlets in each job for the electrical contractor to follow, and the exact number of 16-candlepower lamps to be used.

Frequently the fixture contractor installs more than twelve lights on a circuit, which is in violation of the city ordinances, and causes the consumer very much annoyance in getting electric current to his premises.

It is also suggested that the architects demand of the electrical contractor that he make up all connections and combinations relative to switches, complicated outlets, etc., leaving only two wires for the fixture hanger to make his fixture connections.

#### GENERAL SUGGESTIONS.

In all electric work conductors, however well insuiated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are especially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The foad should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

#### SPECIAL NOTICE.

Place all service switches, meters and cutouts, when practicable, in basements or public places where they will be readily accessible to inspectors, meter readers and trouble men.

In all apartment buildings, office buildings. store buildings and in all other rented properties special meter outlet fittings must be installed. These meter outlet fittings must be of a design approved by the Electrical Department and must be installed at the location where meter is to be set. All wires between cutout cabinet and meter outlet fittings must be placed in conduit and the wires installed and connected by the wiring contractor. The company supplying current shall furnish all wires between fitting and meter and shall thoroughly protect all such wires, where necessary, with flexible tubing. When meters are removed the wires between fitting and meter shall be removed.



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Architects are invited to take advantage of our extensive engineering data covering the varied lighting requirements of store and office buildings, factories, etc.

The services of our illuminating engineer are at your command. Drop us a postal, and be will call at your office.

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## STOP! LOOK! LISTEN!

Install standard size push button switches (Momentary Contact type) at convenient locations in connection with a

#### "DIAMOND H" REMOTE CONTROL SWITCH

and you can economically and conveniently control motors, heavy lighting circuits, vacuum cleaners and burglar alarm systems.

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Manufacturers of Lighting Fixtures of Every Description from

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### Sections of Revised Code of City of Chicago, Governing Electrical Inspections.

MARCH 13, 1911.

CHAPTER XXIV.

DEPARTMENT OF ELECTRICITY.

830. **Electric Current.**—No electric current shall be used for lighting, heating or power purposes except as hereinafter provided.

831. Application—Contents—Permits.—All persons or corporations desiring to install wires or other apparatus for the use of electric currents for any of the purposes mentioned in the foregoing section shall, before commencing or doing any electrical construction work of any kind whatever, either installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor in the office of the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by street and number; and upon receipt of which application, if found proper, such permit shall be given.

832. Duties of City Electrician Thereon .-The said City Electrician shall have power, and it shall be his duty, when by him deemed necessary, to carefully inspect any such installation previous to and after its completion, and it shall be competent for him to remove any existing obstructions which may prevent a perfect inspection of the current carrying conductors, such as laths, plastering, bearding or partitions; and if such installation shall prove to have been constructed in accordance with the rules and regulations of the Department of Electricity, controlling the use of electric current, upon the payment of a fee, as herein provided, he shall issue a certificate of such inspection, which shall contain a general description of the installation and the date of such inspection. Any owner installing or causing to be installed any electric wires to be hidden from view shall, prior to such installation, give said city electrician a reasonable notice in order to give ample time for inspection. The use of electric current is hereby declared to be unlawful previous to the issuance of such certificate; provided, however, the City Electrician may issue a temporary permit for the use of electrical current during the course of construction or alteration of buildings, which permit shall expire when the electrical apparatus for such building is fully installed.

833. (Certificate—Wiring Only and Complete Installations.)—A final certificate for wiring only may be issued by said City Electrician in the case of completed wiring installation, but upon which no current shall be used in the immediate future. Such certificate shall show that at the date of inspection the installation was constructed and erected in accordance with the terms of this chapter, and shall be issued at nine-tenths the rates hereinafter named for complete installation.

Prior to the introduction of electric current into the said premises a second inspection shall be made, when, if the said installation be still in accordance with the terms of this chapter, and the fixture work be correct, a final certificate for complete installation and service shall be issued and the amount of the fee paid for the final certificate for wiring only shall be deducted from the fee for the final certificate for complete installation and service.

Power of City Electrician-Inspections and Re-inspections .- The said City Electrician is hereby empowered to inspect or re-inspect all overhead, underground and interior wires and apparatus conducting electric current for light, heat or power, and when said conductors or apparatus are found to be unsafe to life or property, he shall notify the person or corporation owning, using or operating them to place the same in a safe and secure condition within fortyeight hours. Any person or corporation failing or refusing to repair, change or remove the same within forty-eight hours, or within such further time as the city electrician shall determine is necessary, after the receipt of such notice, shall be subject to the penalty hereinafter provided.

Poles-Covers-Wires-Electric Serv-835. ice Entrances - Switches. - All poles now standing or hereafter erected, and all covers for manholes now in service, or hereafter placed in service for the use of electric conductors, shall be branded or stamped with the name of the person or corporation owning the same; all electric service entrances shall have attached to the conductor or conunctors, in a conspicyous place, a substantial tag designating the owner, and giving such a full description of the conductors as shall meet with the approval of said City Electrician: and all of said electric service entrances shall be properly equipped with approved cut-out service switches. building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb, except where the service wires are placed in conduits complying with the rules of the department of electricity; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk, except where such conduits are used. No electric current shall be supplied from any trolley line for any purpose whatever to any building except for lighting the power stations from which current is supplied to such trolley lines.

836. **Fees.**—There shall be collected by the City Collector for completed installations, prior to the issuance of certificate permitting the use of electric current, the following fees, in the following manner:



# The Name Western-Electric Covers



# Everything Electrical

INTER-PHONES—for intercommunicating service POWER APPARATUS—for every known condition MAZDA LAMPS—for modern and efficient lighting FANS—for ventilating or cooling—home or business SUPPLIES—for every electrical requirement

The Architect and Builder benefit by having our large stocks at their command — our position as the largest distributors and manufacturers of electrical apparatus in the world means good service and fair prices.



# Western Electric Company

Manufacturers of the 6,000,000 "Bell" Telephones

500 South Clinton Street, Chicago, Illinois



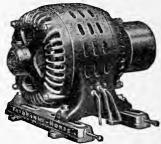
# Dynamos and Motors Alternating and Direct Current

COMPLETE POWER PLANTS

In addition to electrical apparatus we manufacture practically everything in the line of machinery that is required in the building trades.

Write us your requirements
For electrical apparatus see catalog No. 1816DM

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# Electrical Contractors and Engineers

TELEPHONES Central 5740 Automatic 3891

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CHICAGO

C. A. LUNDBERG, Pres. and Secy.

B. H. SUHR

R. A. WALTHER

# B. H. SUHR & CO.

SURVEYORS

FOUNDATION LAYOUTS SETTLEMENT REPORTS

1713 CITY HALL SQUARE BUILDING

139 No. CLARK STREET

TEL. CENTRAL 6316

CHICAGO, ILL.

For the inspection of each of the first two are lamps, one dollar; for three are lamps, two dollars and eighty cents; for four arc lamps, three dollars and sixty cents; for five arc lamps, four dollars and forty cents; for six arc lamps, five dollars and ten cents; for seven arc lamps, five dollars and eighty cents; for eight arc lamps, six dollars and fifty cents; for nine arc lamps, seven dollars and twenty cents; for ten are lamps, seven dollars and ninety cents; for above ten to twenty are lamps, sixty cents each; twenty are lamps, thirteen dollars and ninety cents; for above twenty to thirty arc lamps, fifty cents each; for thirty are lamps, eighteen dollars and ninety cents; for above thirty are lamps, twenty-five cents each.

For incandescent lamps consuming nominally fifty watts each, as follows: For each of the first twenty-five incandescent lamps, ten cents; for each of the next twenty-five lamps, nine cents; for each of the next twenty-five lamps, eight cents; for each of the next twenty-five lamps, seven cents; for each of the next one hundred lamps, six cents; for each of the next one hundred lamps, five cents: for each additional lamp above three hundred, four cents; and for larger and smaller lamps under five hundred watts in the same proportion.

For the inspection of incandescent lamps consuming five hundred watts and over: For each of the first two lamps, one dollar; for each of the next three lamps, eighty cents; for each of the next five lamps, seventy cents; for each of the next ten lamps, sixty cents; for each of the next ten lamps, fifty cents; for each additional lamp above thirty, twenty-five cents.

For each electrical horsepower of seven hundred and forty-six watts used for mechanical or other purposes than above mentioned, the sum of one dollar for each horsepower from one to five horsepower inclusive; for each of the next succeeding five horsepower, seventy-five cents; for each of the next succeeding five horsepower, sixty-five cents; for each of the next succeeding ten horsepower, fifty-five cents; for each of the next succeeding twenty-five horsepower, fifty cents; for each of the next succeeding two hundred horsepower, twenty-five cents; for each of the next succeeding two hundred and fifty horsepower, ten cents; for each additional horsepower, five cents.

## Arc Lamps and Incandescent Lamps of 500 Watts and Over.

Each. 2 lamps @ \$1.00, \$2.00; above 2 lamps to
5 @80c
5 lamps, \$4.40; above 5 lamps to 10 @ .70c
10 lamps, 7.90; above 10 lamps to 20 @ .60c
20 lamps, 13.90; above 20 lamps to 30 @ .50c
30 lamps, 18.90; above 30 lamps @ .25c

#### Incandescent Lamps.

For incandescent lamps consuming nominally fifty watts each, as follows:

25 lamps, \$2.50; above 25 to 50 lamps @ . 9c 50 lamps, \$4.75; above 50 to 75 lamps @ . 8c 75 lamps, \$6.75; above 75 to 100 lamps @ 7c 100 lamps, \$8.50; above 100 to 200 lamps

 \$\text{q}\$
 6c

 200 lamps, \$14.50; above 200 to 300 lamps
 5c

 \$\text{q}\$
 5c

300 lamps, \$19.50; above 300 @......... 4c For larger and smaller lamps under five

hundred watts in the same proportion.

No inspection shall be made for a less amount than one dollar.

Inspection of electric lights other than electric signs as herein defined, placed on a public street or alley for the purpose of illuminating the same, temporary installations for show window exhibitions, conventions and the like shall be charged for according to the time required for such inspections at the rate of seventy-five cents per hour.

Each reinspection of any overhead, underground or interior wires or apparatus shall be charged for according to the time required for such reinspection at the rate of seventyfive cents per hour.

On each installation where a permit has been issued and work not sufficiently completed within three months for wiring only certificate to be issued, and where inspection has been made on such work a portion of the regular fee must be charged for according to the time required for such inspections at the rate of seventy-five cents per hour.

Each reinspection of any overhead, underground or interior wires or apparatus shall be charged for according to the time required for such reinspection at the rate of seventy-five cents per hour.

On each installation where a permit has been issued and work not sufficiently completed within three months for wiring only certificate to be issued, and where inspection has been made on such work, a portion of the regular fee must be charged to cover the cost of such inspection, which will be credited on the final certificate.

Immediately after the inspection provided for in Section \$32, the City Electrician shall make a fee bill, in duplicate, on a form to be approved by the City Comptroller, and shall forward the same to the Comptroller to be recorded and rendered. The person or corporation receiving the fee bill shall pay the amount thereof to the City Collector, who shall endorse payment thereon and enter the fee bill and payment in a book in his office. to be provided for that purpose, and thereupon the City Collector shall deliver the paid fee bill to the person, or corporation, paying the same. The paid fee bill shall then be presented to the City Electrician at his office and thereupon the City Electrician shall issue the wiring only or final certificate for completed installation provided for in Section 810.



TRADE MARK REG. U.S. PATENT OFFICE.

# The Architect Engineer and Owner



Registered U. S. Patent Office

Who carefully considers every detail, initial cost, maintenance charges, elimination of future troubles, good service — should insist that the specifications for electrical work read, ALL WIRING TO BE DONE WITH

# **OKONITE WIRES and CABLES**

OKONITE contains never less than 30 per cent of dry fine Para rubber, without any reclaimed or soft rubber. It is homogeneous in character, placed concentrically about the conductor and has a tensile strength of not less than 1000 pounds per square inch. A distinguishing mark on Genuine Okonite consists of a single ridge running the entire length of the wire.

As General Western Distributors, we carry a complete stock. Also D. & W. Fuses and Safety Devices, Lighting Fixtures, Etc.

# Central Electric Company

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CHICAGO

GEORGE A. ROBBINS PREST, & TREAS. WILLIAM H. ELLIS SECRETARY

### ROBBINS MANUFACTURING COMPANY

1801 No. CENTRAL PARK AVENUE CHICAGO

WINDOW & DOOR SCREENS
WEATHER STRIPS

SALES OFFICE, 625 MONADNOCK BLOCK, PHONE HARRISON 6104
ALL PRINCIPAL CITIES

# Chicago Metal Weather Strip Co.

Our ALL METAL STRIPS (in copper and zinc) are the most perfect and effective DRAFT and DUST SHIELDS for all styles of Windows and Doors.

The No. 1 (resilient copper strip) requires no grooves, removal of the sash nor alteration of the Window; manufactured solely by us.

Phone Humboldt 3715

Home Office and Factory
1617 NORTH TROY ST., Chicago

837. **Alterations,**—No alterations shall be made in any electrical installation without first notifying the said City Electrician and submitting the same for inspection in the same manner as provided for new work.

848. Penalty .- Any person or corporation furnishing or using any electric current within the city, in violation of any of the provisions of this chapter, or contrary to any of the rules and regulations of the Department of Electricity, shall be fined not less than fifty dollars nor more than one hundred dollars for each offense, and each day's use thereof contrary to the provisions of this chapter shall constitute and be a separate and distinct offense. Said City Electrician may, for any violation of the provisions of this Chapter, also order and compel the cutting off and stopping of such current until the provisions of this Chapter are fully comr-lied with.

#### Table of Carrying Capacity of Wires.

For insulated aluminum wire the safe carrying capacity is eighty-four per cent of that given in the following tables for copper wire with the same kind of insulation.

Table A. Table B.
Rubber Other
Insulation, Insulations.

B. & S. G.	Amperes.	Amperes.	Circular Mils
1.8	3	5	1.624

18		5	1,624
16	6	8	2,583
14	12	16	4,107
12	17	23	6,530
10	24	32	10,380
8	33	46	16,510
6	46	65	26,250
5	54	77	33,100
4	65	92	41.740
3	76	110	52,630
2	90	131	66,370
1	107	156	83,690
0	127	185	05,500
00	150	220	133,100
0.00	177	2621	67.800

#### 0000..... 210..... 312.....211,600 Circular Mils.

200.000	200	300
300,000	270	400
400,000	330	500
500,000	390	590

600,000	450 680
700,000	500 760
\$00,000	550 840
900,000	600 920
1,000,000	6501,000
1,100,000	6901,080
1.200.000	7301,150
1,300.000	7701,220
1,400,000	8101,290
1,500,000	8501,360
1.600,000	8901,430
1,700,000	9301,490
1,800,000	9701,550
1,900,0001	
2,000,0001	
_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

The lower limit is specified for rubbercovered wires to prevent gradual deterioration of high insulations by heat of wires, but not from fear of igniting the insulation. Question of drop is not taken into consideration in above tables.

#### Materials.

The following is a list of non-combustible, non-absorptive, insulating materials for the benefit of those who might consider hard rubber, fiber, wood and the like as fulfilling the requirements:

- 1. Glass.
- 2. Marble (filled).
- 3. Slate without metal yeins.
- 4. Porcelain, thoroughly glazed and vitrified.
- 5. Pure sheet mica.
- 6. Lava (certain kinds of).
- 7. Alberene stone.

#### Electric Gas Lighting.

Electric gas lighting must not be used on the same fixture with the electric light.

846. Electric Lighting Facilities—Indemnity.—The city electrician is authorized to execute and deliver in the name of the city of Chicago to any person or corporation affording facilities for any of the city's electric lighting property, contracts of indemnity to hold such person or corporation barmless from all injuries, damages or expense to any persons or property arising in any way out of the city's exercise of such facilities, when such facilities are not afforded under the requirements of ordinances held by them.

# SUGGESTIONS FOR THE PROVISIONS OF WIRING AND CABLING OF BUILDINGS FOR SERVICE OF CHICAGO TELEPHONE CO.

The extensive use of the telephone in office buildings, hotels and large apartment buildings renders it essential that a provision be made in all modern buildings of these types, in advance of their completion, for carrying the requisite number of wires necessary for furnishing telephone service.

Where a private branch exchange switchboard or a building basement terminal is installed it is necessary to carry at least two wires from each telephone to the central distributing point in the building. Where these buildings are furnished telephone service by means of cable it is generally necessary to extend a building cable and establish one or more branch terminals, from which the distributing wires are taken. Hence, the importance of making adequate provision in advance for such building cabling and wiring.

It is advisable to have such provision included in the building plans. Otherwise the walls may be disfigured by unsightly open wire runs, or it will be necessary to make openings through the walls, floors and partitions after the completion of the building.

The Telephone Company will be pleased to furnish the owner or architect with all

# Architects and Builders

Should take the

# TELEPHONE

into consideration when planning or building. Our Facilities Engineer will lend his assistance in drawing conduit plans which will save you time and expense. See pages 165 and 167

CALL MAIN 294



PLANT DEPARTMENT

### CHICAGO TELEPHONE CO.

230 W. Washington Street

hocessary information as to size, type and lecation of conduits. Building wiring may be logically divided as follows:

#### (1) APARTMENT BUILDINGS.

The term apartment buildings as used herein means buildings larger than single houses or stores and smaller than office buildings. Such buildings may contain living and office apartments, also stores, generally on the ground floor,

In an apartment building the maximum number of telephones in any one apartment. or on any floor, is quite definitely fixed, generally one per apartment.

Vertical building conduit, with an outlet at each floor, should be installed in each tier of apartments in an apartment building.

(2) OFFICE BUILDINGS.

The wiring of an office building presents a difficult problem for the following rea-

The number of telephones will depend largely upon the character of the business and district. The number of telephones on any floor of these buildings will depend upon the requirements of the individual tenants. This is not constant for any extended perod, as tenants may from time to time be replaced by others using more or less serv-

In office buildings where the floor is likely to be divided into a large number of reoms or offices the distributing wires from the floor terminals to telephones can be run in moulding. The floor terminals should be located near the ceiling. A suitable moulding should be provided in the halls for carrying the wires from the terminal boxes to the various rooms. A smaller moulding should also be provided in the individual rooms, or suites of rooms, for carrying the wires to the proper location desired.

At certain intervals, depending upon the arrangement of the building in question, it will be desirable to have a piece of conduit extend across the ceiling of the hall in order to distribute from the floor terminal on one side of the hall to the rooms on the other side of the hall, in case there is no terminal on the other side.

With the system above described, the wiring is practically concealed and the system is flexible enough to allow proper distributien of facilities among the various rooms on the floor.

When an entire office building, or several floors of a large building, is devoted exclusively to the purposes of one firm, some floors are generally not subdivided into small rooms, yet it is necessary to supply telephone service to many desks in the large rooms, and it is desirable to have the telephone wiring concealed.

If the room has columns and the desks can be grouped along the walls and about the columns, outlet boxes can be placed adjacent to these groups of desks and these outlets connected to distributing centers by iron conduits, as described under "Hotel" wiring.

Where a very large use of telephones is contemplated, outers may be placed in the Hoors on approximately five-100t centers, which outlets are connected to distributing centers by a faceral sistem of ducts or iron conduits.

#### (3) HOTELS.

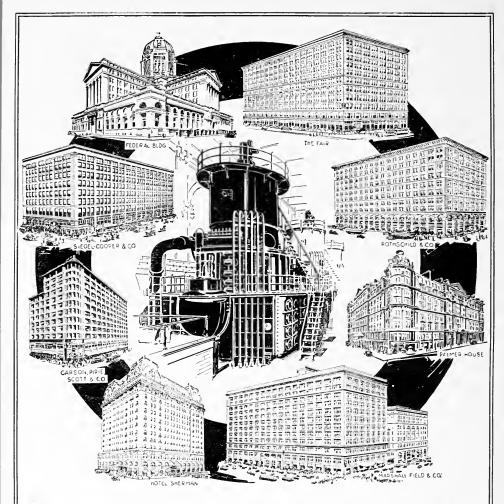
Depending upon the size and location, type and kind of bailding and enaracter of service contracted for, a notel may be included in either the once banding class or the apartment building class or a part of both.

Where a very large use of telephones is contemplated, outlets may be placed in the fleers on approximately five-foot centers. which outlets are connected to distributing centers by a lateral system of ducts or iron conduits.

The telephone system installed in hotel buildings consists of a telephone switchboard located at some convenient point, usually en the ground floor, in or near the office. Telephones are placed in each room or suite and wired to the switchboard, which is connected by one or more trunk lines with the nearest exchange of the Telephone Company. The wiring problem is, therefore, comparatively simple, involving the running of a pair of wires from some definite point in each room or suite to a common center near the switchboard location. Provision should also be made so that the Telephone Company can run its trunk wires from the switchboard to the point at which the telephone cable caters the building from the street, usually in the basement. A two (2) inch conduit is frequently sufficient for this purpose.

The method of getting wires from the common point (switchboard) up through and to the various floors, also the provision for terminating service cables, is the same as above described for cabling of office build-

From the floor terminal a conduit one-half (12) inch inside diameter is run to a designated location in the wall of each room in which a felephone is to be placed. The height of the outlets in each room should be about five (5) feet from the finished floors; this will depend largely upon the desire of the hotel architect or owner. A onehalf (14) inch (inside diameter) conduit should not be over fifty (50) feet in length, nor have more than three bends with a neirimum radius of five (5) inches. Any conduit one hundred (100) feet in length should not be less than one (1) inch inside diameter. One-half (12) inch (inside diameter) conduit should be provided for a maximum of two pairs of wires; three-quarters (34) inch (inside diameter) conduit for five pairs; and one (1) inch (inside diameter) conduit for nine pairs. In extending conduit from terminal boxes to rooms it is possible in many eases to use one run of larger conduit to supply three or four rooms, rather than run smaller conduit to each individual room. When the floor area and the number of rooms are large it may be found economical to have more than one terminal box on a floor.



# Modern Buildings Use Edison Service for Lighting and Power

and find this service more reliable, more economical, and more satisfactory in every way than making their own electrical energy. This is an age of specialization. Our business is the production of electrical energy. There are numerous advantages to be gained from the use of Central Station



Service. • The one turbo-generator shown above is capable of supplying all of the electricity used for lighting and power in all of the above buildings, and as many more, without dirt, noise, vibration or the occupancy of valuable space by more valuable machinery. Let us figure with you.

Commonwealth Edison Company
120 West Adams Street

### REGULATIONS GOVERNING COMMONWEALTH EDISON CO.'S SYSTEM.

#### INSPECTION

All wiring which is to be connected to the mains of this Company must be installed in accordance with the rules and requirements of the Department of Electricity of the City of Chicago, the Chicago Underwriters' Assoof Chicago, the Chicago Underwriters Asso-ciation, and this Company, and will be in-spected by this Company's Inspectors. A "certificate for installation" or "temporary current permit" from said Department of the City must be presented at the office of the Inspection Department of this Company before current can be turned on to any new wiring. The Company should be notified whenever any additional apparatus is desired to be connected to consumer's wiring in order to avoid interruption of consumer's service and injury to the Company's meters or other apparatus. The Company will make the final connection of all wiring to its mains.

In case of a violation of this rule resulting in damage to the Company's apparatus, the party responsible for making the connections will be held liable.

#### SYSTEMS OF DISTRIBUTION

Current is delivered to consumers of this Company by three different systems, viz.:

Direct-current three-wire Edison, operating at 115-230 volts, for fight and power. Alternating-current, sixty-cycle, singlephase, three-wire Edison, operating at 115-

230 volts, for light and small power. 3. Alternating-current, sixty-cycle, phase, three-wire, operating at 230 volts, for power only.

#### Direct-Current Territory

Current is supplied from the Edison threewire direct-current system in approximately following territory:

North Side. South of Wisconsin street, east and north of the Chicago River.

West Side. West of the Chicago River

to Morgan street between Kinzie street and 22nd street, except on Milwaukee avenue, where the direct current extends to Wood street; on West Madison, where it extends to Ashland avenue, and on Blue Island ave-

nue, where it extends to Throop street.

South Side. In the "down town" district.

South to 35th street between Stewart avenue and Cottage Grove avenue.

From 35th to 39th between Dearborn street and Grand boulevard, and on Cottage Grove avenue from 35th to 38th streets.

#### Alternating-Current Territory

Current is supplied from the alternatingcurrent Edison three-wire system for lighting and small power in all parts of the City, other than those above described, where the

Cther than those above described, where the Company has lines.

Current is supplied for power from the three-phase system in a large part of the alternating-current territory, but inquiry should be made of the Inspection Department as to the proximity of three-phase lines to any particular location where power may be desired.

may be desired.

It is also suggested that inquiry be made

at the Inspection Department of the Company as to the character of the service which will be given in locations which are near the dividing lines above described, as these boundaries are subject to change at any time and alternating and direct current

ines sometimes overlap each other.

The Company will not be responsible for mistakes of any nature whatever, resulting from information given verbally or over the telephone unless same is confirmed in writing by the Company.

#### THREE-WIRE SYSTEM

Lighting installations which exceed the equivalent of 24-16 C.-P. lamps of 50 watts each, must be wired with three-wire mains from the service to centers of distribution, the branch circuits being balanced as nearly as possible at these points.
This rule will not be held to include single

battery charging outlets, stereopticons, etc.,

which consume more than 1,200 watts.
All mains whether two-wire or three-wire should be designed to deriver the maximum burning load at the distribution center with not over 2 per cent loss in voltage.

#### SERVICES Underground

The consumer's wiring must be extended to the Company's nearest service and provided with the necessary service switch and cut-outs.

If current is desired in premises where circumstances are such that a separate service is necessary for the premises, application should be made to the company to have a service installed.

In case it is necessary to extend service inside of the property line in order to reach the building, the expense of the installation the portion inside the property line must Le borne by the consumer. Final connection or the wiring to the service will be made by this Company in all cases.

#### OVERHEAD

The consumer's wiring must be brought outside the building wall nearest the Company's distributing lines at some point at least 25 feet above the ground, so located that it will be readily accessible to service wires brought from the Company's nearest pole. In case the pole line from which service is to be given is not in position at the time interior wiring is being done, inquiry should be made at the Inspection Department for information as to its proposed partment for information as to its proposed location.

Inside wiring must not be brought out of the building in an enclosed air shaft, as the City ordinance forbids the erection of wires across a roof to reach wires in such a place. Also City ordinance does not permit wiring on building walls.

Individual services will not be run for small adjoining buildings under the same

ownership.

#### ALTERNATING-CURRENT MOTOR AND ARC LAMP

On the alternating-current system, separ-

ate services will be provided as follows: For motors of one horse-power or larger, for arc lamps where a large installation is

made and for stereopticon are lamps.
Inquiry should be made of the Inspection Department in all cases where more than ten alternating are lamps are being wired, as to whether incandescent and are lamps

may be wired to the same service.

Separate mains and meter loops are of course necessary for all wiring fed by sep-

arate services.

#### METERS

Meter loops must be provided in the mains at an accessible point, and so arranged that the meter may be mounted with ordinary wood screws on the wall. A meter board must be provided of sufficient size to allow the installation of a recording watt meter and maximum demand meters. Two de-mand meters are installed on three-wire mand meters are installed on three-wire mains. Maximum meters will not be installed on installations under one kilowatt. Sufficient space must be provided about the

WM. SCHLAKE, PREST.

WM. G. BOHNSACK, SECY.

C. B. VER NOOY, VICE-PREST. & TREAS.

### ILLINOIS BRICK COMPANY

916 CHAMBER OF COMMERCE

CHICAGO

TELEPHONES | MAIN 17 | AUTOMATIC 3-2461

B. F. WEBER, PRESIDENT
F. W. LABAHN, VICE-PRESIDENT

L. RIEMER, TREASURER H. BUSSE, SECRETARY

# NATIONAL BRICK COMPANY

MANUFACTURERS OF

#### CHICAGO BUILDING AND SEWER BRICK

CAPACITY, ONE MILLION BRICK PER DAY

YARDS AT WEBER STATION, C. & N.W.R. R. MAYNARD, INDIANA, THREE RAILROADS
CHICAGO HEIGHTS, SIX RAILROADS

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FIRE BRICK-FIRE CLAY-FLUE LINING
WALL COPING-PARTITION TILE-BOOK TILE
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JOSEPH MITCHELL SECRETARY

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# McLAUGHLIN BUILDING MATERIAL CO.

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PARTITION TILE
PORTLAND CEMENT
UTICA CEMENT
LOUISVILLE CEMENT
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LIME
PLASTER
HAIR AND FIBRE
WOOD LATH
METAL LATH
CORNER BEADS

PIN ANCHORS

YARD No. 1—40th Avenue and Taylor Street, Phone Kedzie 3198 YARD No. 3—14th and Lumber Streets, Phone Canal 230
YARD No. 5—48th and Avondale Avenue, Phone Irving 325

YARD No. 7-638 Kingsbury, Phone North 4877

YARD No. 9-1800 Balmoral Ave., Phone Ravenswood 64

meters to allow the removal of the case as indicated in drawing on page 23. Meter boards should not be erected on a wall which is subject to any considerable vibration, or in places subject to excessive moisture or heat. A pressure wire tap must be provided in all cases where all wires of the circuit are not looped out. On three-wire mains the pressure wire tap must be made on the neutral wire. The general arrangements of meter loops should be such that a meter can be installed without crossing any wires, if possible. If this is impracticable, sufficient nexible tubing should be left on the wires to make possible an installation which will be in accordance with the City rules.

Meter loops should not be placed above seven feet from the floor, and as near the point of entrance of service as possible. In office buildings meter loops should be

In office buildings meter loops should be located at a central point in meter closets or public corridors, and in apartment buildings in the basement of the building, so that meters may be installed and maintained without annoyance to tenants.

Meter loops must be located relative to fuses so that meters are protected by the fuses. See Figs. Nos. 1, 2 and 3. They must never be placed between the service and the service switch. Generally speaking, more than one meter installation will not be provided for the same class of service in any one building.

Meter loops for service to supply temporary lighting or power to new buildings during construction must be located on adjoining premises. In such caces, where meter loops cannot be installed on adjoining premises, special arrangements must be made with the Contract Department. No three-wire meters larger than 200 amperes are used. Installations requiring meters of larger capacity will be provided with two meters, one on each side of the three-wire main; space should be allowed accordingly in arranging meter boards.

The breaking of meter seals by unauthorized persons or the tampering with the meters or cut-outs protecting the same or anywires or switches in connection with the meter wiring, is prohibited by law and will not be permitted by the company. Attention is called to Revised Statutes of Illinois, Chapter 28, Section 117, in force July, 1895. The penalty for the breaking of this law is a fine not exceeding \$250, or imprisonment not exceeding three months, or both.

#### CUT-OUTS

All fusible cut-outs on circuits carrying 15 amperes at 115 volts per wire or less must be of the Edison plug type. Cut-outs must be equipped with plugs of proper size at the time of installation.

In cases where Cartridge fuse blocks are installed, the Company will not furnish free renewals of fuses.

#### SOCKETS

All sockets must be designed for use with Edison base lamps.

#### MOTORS

Wiring for motors should be so arranged that the current used for power purposes may be metered separately from that used for lighting. Wiring for elevators should also be arranged so that current used on elevators may be metered separately from that used for other power.

All motors larger than 1 H. P. must be wound for 220 volts, and it is preferred that motors of 34 H. P. and larger be so wound.

Alternating-current motors must be designed to operate at a frequency of 60 cycles.

No motors larger than 5 H. P. will be supplied on single-phase system, except by special permission, given by the Inspection Department of the Company in each case.

Motors of 5 H. P. and larger will be supplied on the three-phase system at 60 cycles, 220 volts, where three-phase current is available.

No motor will be connected which requires more than three times full load current in starting without load.

#### LAMPS INCANDESCENT

Standard shape Edison base incandescent lamps will be turnished free of charge for restallations and renewals, unless otherwise provided for by the terms of the contract, in 4, 8, 10, 16, 32 and 50 candle-power sizes.

One lamp will be furnished for each socket installed in the customer's premises at the time the installation is made. Additional lamps will be furnished at any time when additional sockets have been wired. A reserve supply of lamps, equal to approximately 10 per cent of the customer's total installation, will be advanced for convenience in making renewals. Worn out or charge (except special lamps) upon presentation of the old lamps with glass intact to the lamp renewal delivery wagon.

Lamps for renewal will be delivered to customer's premises by wagon upon request by telephone or otherwise.

Lamps of any candle-power may be changed for those of another candle-power unless such change is forbidden by the terms of the contract.

Lamps frosted or colored by dipping will be installed or renewed without an extra charge.

Special lamps will be furnished for installation and renewal subject to an extra charge. This charge is made whenever the lamp is installed or renewed.

Owing to the fragile nature of Tungsten lamps, our representatives will install and zenew all Tungsten lamps. They will test same in the presence of the consumer, the Company assuming no responsibility after our representatives have left the premises.

All lamps furnished for installation, reserve or renewal, remain the property of the company. The consumer must therefore give his receipt for all lamps delivered to him for installation, reserve or renewal, agreeing to pay for lamps unaccounted for at 20 cents each.

#### ARC LAMPS

Are lamps having a standard black finish are provided by the Company for the customer's use free of charge. Lamps having ornamental finish will be supplied only at an extra charge. All lamps so supplied remain the property of the Company, and the consumer must give the Company his receipt for same, agreeing to pay for any lamps unaccounted for at \$16.00 cach.

Lamps furnished by the Company will be cleaned and trimmed by the Company free of charge when used for general lighting purposes. Are lamps used for photographing or other purposes than general illumination must be provided and maintained at the consumer's expense. A hanger board must be provided for use in hanging inside lamps and a suitable crane provided with a hook must be provided for outside lamps. They must be installed so that the bottom of the lamp will not be less than eight feet above the ground when it is hung, the length of the lamps being about 40 inches. If it is necessary to install lamps beyond the reach of a six-foot stepladder, some arrangement must be made for lowering the lamp so that it may be trimmed.

Are lumps will not be furnished or maintained free of charge by the Company when used in buildings in course of construction or in buildings being wrecked.



ARCHITECTS—In preparing plans and specifications for large buildings should provide for an

# Automatic Private Branch Exchange

The space occupied by this type of apparatus is much smaller than is required for a system using operators and for this reason as well as on account of eliminating the operator, it is much more economical.

The service is instantaneous, reliable, and secret and far more satisfactory than can be obtained with any other equipment.

This equipment provides a perfect interior telephone service, through which connections can be made with all patrons of our system, which is being rapidly extended to all parts of the city.

# Illinois Telephone and Telegraph Company

162 West Monroe Street



Commercial Dept. 33-111

Engineering Dept. 369-219



# SUGGESTIONS FOR THE PROVISIONS OF WIRING AND CABLING OF BUILDINGS FOR TELEPHONE SERVICE.

Wiring and Cabling of Buildings for Automatic Telephone Service as Recommended by the Telephone Department of the Illinois Telephone & Telegraph Co.

The rapidly increasing use of the Automatic Telephone renders it necessary that provision be made in all types of buildings fer furnishing this service. Should this provision be omitted in the construction of a new building, the providing of facilities after the building is completed can be done only at more or less inconvenience to the eccupants of the building, and at a greater cost than if done at the outset. Adequate provisions should, therefore, be made for Automatic Telephone service in the original plans, and should be within the finish or construction of the building. If provision is not so made, open wire runs will be necessary after the building is completed, thereby, to a greater or lesser degree defacing the walls and woodwork.

The necessary requirements for a building will depend upon the size, ground plan and the business of the occupants, and while the telephone requirements of buildings of like character will be similar, special conditions may necessitate particular requirements. Therefore, it is desirable, especially in large buildings, that the Automatic Telephone requirements be estimated as closely as possible, and the Illinois Telephone & Telegraph Co, will be glad to afford such assistance as may be requested in the preparation of plans for this service.

Buildings, from a telephone standpoint, may be divided into two classes, namely:

A. Office Buildings.

B. Hotels, Clubs, Hospitals, Commercial Houses, and Factories.

#### Office Buildings.

The telephone requirements will depend upon the character of the business district in which the office building is located. The wiring and cabling in office buildings demands an extensive system for the reason that the exact location and number of telephones cannot be definitely determined. The location of the telephone cannot be considered permanent, as the office arrangement is liable to be changed at any time. A very flexible arrangement is, therefore, necessary and one which will permit wires to be run to any part of a room. Such an arrangement can be obtained by wire raceways in halls, and picture moulding in rooms; the raceway providing for the telephone wires from the terminal boxes to the various rooms of the fleor.

The telephone cable from the Automatic Exchange should extend in conduit from the point where it enters the building to the cross connecting terminal box. This box should be located in the basement in a permanently dry location so as to be readily accessible to the employees of the Telephone Company.

From this cross connecting box the house cables should extend to one or more vertical telephone shafts. The cables should be in conduit from the cross connecting box to the vertical shaft. The cable in the vertical shaft should be provided with terminal boxes on each floor, the number depending upon the floor area and located adjacent to the shaft, and so constructed as to permit the wires in the raceways being readily connected to the terminals. The raceway should be built in the walls of the corridors on a line with the picture moulding in the offices. The raceways should be so constructed as to permit of ready access to the wires. Where it is impossible to make the raceway continuous, conduit of ample size should be provided in order to afford a continuous runway for the wires,

Inasmuch as the corridor raceway is a runway for all signal and telephone transmission wires in the building, the raceway should be of ample size in order to permit the possible installation of automatic telephone service in every office.

## Hotels, Clubs, Hospitals, Commercial Houses and Factories.

In Hotels, Clubs and Hospitals, the number of telephones is definitely fixed, being approximately one telephone to each chamber. In Commercial Houses and Factories the number of telephones will depend upon the general lay out of the departments. In buildings of this nature, telephone service will generally be provided by means of a private branch exchange switchboard.

The private branch switchboard should be located in or near the general offices, and the cross connecting terminal box should be located adjacent to the switchboard. The cable from the automatic central exchange should be encased in conduit from the point where it enters the building to the cross connecting box. A conduit should also be provided from the cross connecting terminal box to the private branch exchange switchboard.

One or more vertical shafts should be provided for distributing the house cables to the various floors, and provisions should be made for one or more floor terminal boxes on each floor, the number depending upon the number of telephones on each floor. From these floor terminal boxes, conduit should extend to each proposed automatic telephone location and should terminate in a suitable outlet box. The center of the outlet from the finished floor should be as follows:

Wall sets 4'—6" Desk sets 2'—0"

Should the above provision be made for Automatic telephone service the necessity of corridor moulding, wire runs around base-boards, doors and corridor easings will be eliminated.

# The LIGHTING PROBLEM

The strongest evidence that we can advance in support of our contention that every Building should be piped for gas during construction can be found in our records, showing that we are sooner or later called upon to furnish gas to occupants of most every building in the City.

We can prove that the builder who for special reasons leaves gas out of his specifications, eventually changes his plans and uses or rents his buildings for a purpose it was not originally built for.

When it is finally necessary to install gas it means a lot of tearing up of floors and walls, and a loss of time and money to all concerned.

For this reason it is clearly a matter of plain economy to have every building piped for gas during process of construction.

We will be pleased to send one of our engineers free of charge to consult with any architect or builder in regard to special requirements, proper appliance or installation problems.

Gas burned in modern appliances will furnish a larger volume and more satisfactory light, heat and power for the money than will any other method.

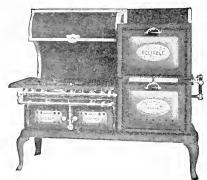
Please remember that our experts are at your service

### THE PEOPLES GAS LIGHT & COKE CO.

Peoples Gas Building

Telephones | Randolph 4567 | Automatic 64-175

# "Reliable" Gas Burning Appliances



No. 308 RELIABLE Cabinet The most complete family gas range ever built Ranges for Family Use, Hotel and Restaurant Ranges, Laundry Stoves, Kitchen Boiler Heaters, Heaters, Parlor Grates and Radiators

Combine

Attractive Appearance Capacity and Efficiency Convenience to User. With
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Into the Highest Development Attained in Gas Appliance Manufacture

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#### GAS FITTERS' RULES

Of the Peoples Gas, Light and Coke Company.

#### OFFICE BUILDINGS, DWELLING HOUSES AN | FLATS. MANUFACTURED GAS FOR LIGHT

The following rules governing the piping of buildings for the distribution of gas for light and fuel have been adopted by The Peoples Gas Light and Coke Company.

**PIFING**—Should be inspected as soon as possible after it is finished, and before the building is lathed. Twenty-four hours' notice will be required of gas fitter. It should be inspected again after completion of building and before fixtures are hung. V such inspections have been made by the Gas Company 's inspectors, and the material used performed conform and labor the standards established in the rules herein,

standards established in the rules herein, the Gas Company will issue a certificate of 'he form shown below. If the rules governing the sizes of pipe to be installed are not in any instance clearly understood, or if unusual conditions are met with, not covered by the rules, the Gas Company should be consulted. This Company reserves the right to alter, amend or revoke these rules, as may from time to time appear for the best interests of the Company and its patrons.

All gas fitters' rules heretofore issued by this Company are hereby revoked.

#### The following tables show the size and length of Pipe allowed:

Size of Pipe.	Greatest Length Allowed.	Greatest Number of %" Openings Allowed.	Size of Pipe.	Greatest Length Allowed.	Greatest Number of 38" Openings Allowed.
38 inch 12 inch 34 inch I inch 114 inch	20 feet 30 feet 60 feet 70 feet 100 feet	2 openings 3 openings 10 openings 15 openings 30 openings	1½ inch 2 inch 2½ inch 3 inch	150 feet 200 feet 200 feet 300 feet	60 openings 100 openings 200 openings 300 openings

#### STORES HOSPITALS, SCHOOLS FACTORIES ETC MANUFACTURED GAS FOR LIGHT.

Size of Pipe.	Greatest Length Allowed.	Greatest Number of ½" Openings Allowed.	Size of Pipe.	Greatest Length Allowed.	Greatest Number of ½" Openings Allowed.
1/2 inch	20 feet	1 opening	1½ inch	100 feet	20 openings
3/4 inch	60 feet	8 openings	1½ inch	150 feet	35 openings
1 inch	70 feet	12 openings	2 inch	200 feet	50 openings

For stores the running line to be full size to end of last opening. All drops to be ½ inch with set not less than 4 inches. Twenty feet of %-inch pipe allowed only for bracket lights.

Window lights to be 1/2 inch.

Drops in churches, schools, public halls, stores, double parlors, large rooms and halls of office buildings, etc., should be not less than 1/2 inch for each 168 square feet of floor space.

#### BUILDING SERVICES.

#### In running service pipe from front wall to meters the following rules will apply:

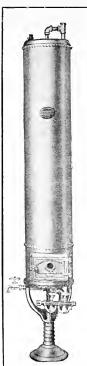
Size of Opening.	Greatest Length Allowed.	Greatest Number of 34" Openings Allowed.	Size of Opening.	Greatest Length Allowed.	Greatest Number of 1" Openings Allowed.
1 inch	70 feet	1 opening	1½ inch	150 feet	5 openings
1½ inch	100 feet	3 openings	2 inch	200 feet	8 openings

All openings in service must be equal to the size of riser, which in no case must be less than 1 inch.

#### MANUFACTURED GAS FOR FUEL.

Size of Pipe.	Greatest Length Allowed.	Greatest Number of % Openings Allowed.	Size of Pipe.	Greatest Leugth Allowed.	Greatest Number of 34 Openings Allowed.
34 inch 1 inch 114 inch	50 feet 70 feet 100 feet	1 ¾-in. or 2 ½-in. 2 or 1 ¾-in. and 2 ½-in. 4 or 2 ¾-in. and 4 ½-in.	1½ inch 2 inch	150 feet 200 feet	7 or 4 $\frac{3}{4}$ -in, and 6 $\frac{1}{2}$ -in. 15 or 8 $\frac{3}{4}$ -in, and 14 $\frac{1}{2}$ -in.

For mantels, grates and small heating appliances, for heating space not to exceed 1,728 cubic feet, thirty feet of ½-inch pipe is allowed for one opening only, and two such openings are considered as one \( \frac{3}{4}\)-inch opening.





& RANGE BOILER

### IS THE STANDARD OF THE WORLD FOR THIS TYPE OF HEATER

The "Superior" furnishes an unlimited supply of HOT WATER every hour of the day or night.

The "Superior" occupies no more space than the regular range

boiler.

The "Superior" is the only combination Gas Water Heater and Range Boiler having a Water Spreader free from flat surfaces, pockets or dead ends. The "Sur

Superior" Burner represents a new principle in gas combustion.

The "Superior" eliminates the dangerous pilot light. The "Superior" is equipped with a large fire door affording easy

access to the burners.

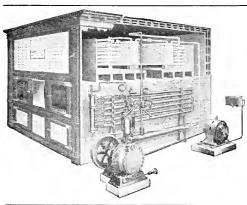
The "Superior" is safe, economical and efficient.
The "Superior" will give satisfaction to your clients
See a demonstration of the "Superior" at our office in the Schiller Building, or our representative will call promptly upon request.

### BASTIAN-MORLEY COMPANY

709 Schiller Building, CHICAGO

Phone Randolph 5747





### WOLF, SAYER & HELLER

Manufacturers of Ice Machines and Refrigerating Machines

REFRIGERATORS, COOLING ROOMS

For Meat Markets, Grocers, Hotels, Restaurants, Clubs, Flats and Private Residences

STORE FIXTURES Office and Factory: Cor. Fulton and Peoria Streets
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# Cantilever Flat Slab System

DESIGNS and **ESTIMATES FURNISHED** 

The most approved type of Beamless Reinforced Concrete Construction

Reinforcing Steel, Plain, Twisted and Deformed Bars, Girder Frames, C. S. P. Spirals, Inserts, Bar Bending of all kinds

CATALOGUES ON APPLICATION

CONCRETE-STEEL PRODUCTS

18th FLOOR McCORMICK BUILDING

CHICAGO

#### RESIDENCE OR FLAT OF 12 ROOMS OR UNDER

Kitchen opening—not less than ¾ inch. Laundry opening—not less than ½ inch. Fire-place opening—not less than ½ inch.

#### RESIDENCE OR FLAT OF 13 ROOMS OR OVER

Kitchen opening—not less than 1 inch. Laundry opening—not less than ¾ inch. Fire-place opening-not less than 1/2 inch.

All Ruud, Monarch and Humphrey water heaters, and other heaters of this type, should be provided with separate runs as provided in the following table:

Humphrey No.	Pittsburg No.	Ruud No.	Size of Pipe Inch.	Consumption Per Hour	Size of Meter.
3A	3	3	1 ½	180	10-Lt. B or 20-Lt. Reg.
4A 6A or	4 6	$\frac{4}{6}$	1 1/2	$\frac{240}{360}$	45-Lt. 60 Lt.
6B 8B	8	8	2	460	100-Lt.

#### GAS ENGINES.

Supply for gas engine must be separate. An independent service will be required, and a governing-holder or other similar device acceptable to the Company must be used.

It is advised that before proceeding with the installation of gas engines, or piping for same, consultation be had with Gas Company.

#### SIZE OF METER AND PIPE CONNECTIONS FOR GAS ENGINES.

Size of Engine H. P.	Consumption at Rating Per Hour.	Size of Meter.	Size of Service Inches.	Size of Supply Inches.	Size of Exhaust Inches.
1	25	5	1	34	1
2	50	5	1 14	3,4	114
4	80	10	114	1	1 1/2
5	100	10	1 1/2	1	1 1/2
7	140	20	$1\frac{1}{2}$	1	1 1/2
10	180	2.0	2 12	1 14	2
12	220	3.0	2	1 1/2	2
15	270	45	2	1 1/2	2 1/2
20	360	60	3	1 1 5	3
25	450	60	3	2	3
30	540	100	3	2	4
35	630	100	3	2 ½	4
40	720	150	3	3	4
50	900	150	3	3	5
100	1800	250	4	4	6
125	2250	250	4	4	6

The above schedule is approximate, the actual figures being covered by conditions.

#### SPECIAL NOTICE.

Gas fitters are requested to inform customers moving from one location to another that it is necessary to apply at the office of the Gas Company to have gas shut off at old and turned on at new address. This will prevent anyone using gas in their name at old location, and will also relieve them of any responsibility for bills of former tenant at new

This Company does not permit anyone but its own authorized employes to place any piping or connections on any part of either the outlet or inlet meter connections, turn on the gas, disconnect, move, or interfere in any way with its piping, meters or connections.

If meters are connected and customer desires to make alterations in house piping, and if to make such alterations it is necessary to disconnect meter, then the customer is required to call at the Main Office, 122 Michigan Avenue, and sign an order for the disconnection of meter, and for the resetting of It after the alterations in house-piping have been made. All charges for work of this character are payable with order.

#### CONNECTING APPLIANCES.

Fitters are particularly requested to see that all gas-burning appliances are connected solid with iron pipe. Under no circumstances will this Company approve of the use of lead pipe or rubber tube.

#### SUMMARY.

When risers are located in rear of basements or in rooms provided for that purpose, or on different floors, the building service must be brought to front of building and within 18 inches of the front wall or parti-tion. Old or new buildings that have no basements, or in basement flats where the building service pipe is extended to the front wall over or under the joists, before floor is laid, it will be necessary to notify the Company in advance so that street service can be run into building before floor is laid.

In finished basements where service connections may have to be made above the floor level, an opening must be left in the wall where street service can be introduced without disturbing anything. Inspection Department will, on notification, instruct gas fitters where to leave such opening,

When new piping is installed in old buildings for illumination, an independent pipe should be run for fuel, to be connected to light riser at meter end with union or right and left coupling.

Ends of openings for fuel for kitchen must be 3 inches above floor and 2 inches clear of baseboards.

Openings for mantels or fireplaces must be ½ inch above finished bottom of fireplace an: 6 inches from slde or back.
Drops must be extended 1½ inches below unfinished ceilings or ½ inch below finished.

ceilings.

public hall and Openings for vestibule, public hall and basement light in two flat buildings or over, should be taken from an independent pipe, an opening left on building service, so a separate meter may be set for hall and basement lights, or riser may be connected with union or right and left coupling to meter of the applicant, who may wish to pay for the gas used.

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When running pipe for exit lights in theatres, schools, amusement and assembly halls, refer to the city building ordinance.

To avoid trapping, gas fitters must grade all pipe to riser or drops.

Branches or cross-lines of pipe from the main line must have a set not less than 4 inches dropped square, and must be well secured to joist by gas-hooks or galvanized straps.

Openings must be closed with iron caps, no split pipe or broken fittings repaired with cement or lead will be allowed.

Drops on branch lines and openings for side brackets must be square bends; no nipples allowed.

Meters will not be set where they are not easily accessible, or where they are exposed to frost or dampness, or liable to injury from any cause.

In all cases where extensions are made, care must be taken to break pipe where the size can be maintained, and in no case shall extension be made from small pipes.

Cast-iron fittings, bushings or unions concealed at any point away from the service or riser connection are not allowed. The risers in buildings must in no case be less than % inch and must be run inside of inside partitions, not closer than 4 feet to any outside wall and must not extend lower than 1½ inches below a finished ceiling and 2 inches below an unfinished ceiling and should not be higher than 9 feet from floor. Vestibule to be considered as an outside partition. The end of risers in stores must not be located under deck or bulkhead of show-window, or over any side openings for gas or electric light.

Risers for residences or apartment buildings must not end in stairway closet, or in bedroom closets or under sinks, washstands, sidewalks, bedrooms, under enclosed stairway, over side lights, over toilet stools in way of flush tank, or in basement less than 6 feet high.

Riser must not be placed in a front hall less than 10 feet from the outside wall nor must it be placed too close to an electric shut-off box.

In apartment buildings it is desirable to set meters in the basement or in a room provided for the purpose. If they are to be set on different floors, location should be provided so that they may be accessible without entering the apartments. Do not locate risers in laundry, furnace, or boiler room.

Risers in any building must not be less than:

- 2 feet from floor for 2 to 10 openings;
- 2 feet 6 inches from floor for 10 to 30 openings:
  - 4 feet from floor for 30 to 60 openings;
  - 5 feet from floor for 60 to 100 openings;
  - 6 feet from floor for over 100 openings.

The Company reserves the right to determine in all cases the location of the meters.

In new or old buildings an opening should be provided for service pipe to pass through walls when same are being constructed. The most preferable way would be to build a sleeve of wood, rectangular shape, 12 inches by 5 inches with an inside partition about 6 inches from the street end of sleeve. Application should be made to the Superintendent of Distribution at the Gas Company's main office to locate the wall where the sleeve should be built in, so that when service pipe is run it will pass through 'the opening provided for it. In this way the damaging of foundation walls will be avoided.

When pipes pass through masonry, pipes must be encased, the gas-pipe resting on the bottom of the casing-pipe, with a clearance of one-half inch on top.

In all cases where pipe is to be imbedded in concrete or cement the pipe should be covered with tar paper or other suitable covering, or laid in conduit pipe.

To avoid complications, gas fitters should consult the Company before locating risers in corner buildings.

Hotels, boarding houses, restaurants, etc., should be considered special work.

Opening at meter end where risers are connected must be one size larger than the largest sized riser.

The extension of service-pipe from front to rear building should not be of less than 1½ inch size.

### BUILDING SERVICES.

In double flat buildings having but one entrance, fitters are required to extend service from various headers to the front wall and connect same, the opening for street service to be one size larger than the largest size in building service. Terminate same at front wall so that street service may be run clear of private walks or other obstructions.

In apartment buildings, one building servlee extended from the different group of risers to the front wall of building will answer, provided access to the different group of risers can be obtained inside of basement proper, otherwise an independent service should be extended to front wall.

### STORES.

Buildings containing stores only should have a separate service for each store.

When riser ends in rear of store an independent service should be extended to front wall of basement. If there is no basement under building, Company must be notified so that Gas Company service may be run before the floor is laid.

Underground work by gas fitters between main and meter will not be accepted.

Ir flat buildings where appliances are installed for the joint use of tenants, such as laundry stoves, driers, etc., run pipe from each tenant's meter to laundry and provide a header with a lock-cock for each tenant. Fasten securely to each cock a metal tag with the flat number plainly marked thereon. An opening for light in laundry may be taken from end of laundry header.

Work must be proved with mercury gauge, not less than a six-inch column of mercury being allowed.

It is the purpose of this Company strictly to enforce the above rules, and no certificate of inspection will be given when they are not complied with.

Architects, builders and owners of buildings are requested not to allow bill for gas fitting unless accompanied by a certificate of inspection.

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# SPECIFICATIONS FOR STANDARD HOLLOW TILE FIREPROOFING.

GENERAL.—The contractor for this work will be required to furnish all the material and labor of every description required to erect the same in place complete. The contractor is referred to the plans and details for the general construction, and especially the steel diagrams and details showing connection between the structural steel and tile work.

SPECIAL SHAPES.—The contractor shall furnish all necessary special shapes for the proper fitting to the steel work.

DETAILS.—When requested to do so the contractor shall furnish large scale details or full sized drawings for all special shapes, column coverings, lintel covers, girder covers, and general type of arch, which shall be submitted to the architects for their approval.

SCAFFOLDING, TOOLS, ETC.—Furnish all the tools, machinery, hoisting apparatus and centering necessary to carry on the work at the rate of progress stipulated in the contract.

TILE.—All the tile required for this work shall be of the best quality of hard burned fire clay, semi-porous, or porous terra cotta. This tile to be well manufactured, no badly split, cracked or warped tile will be permitted to go into the work.

MORTAR AND LAYING.—All tile work for the floor construction shall be laid in mortar composed of one (1) part American Portland Cement, of approved brand, four (4) parts sharp sand and one part (1) lime mortar, all thoroughly well mixed together as follows: The sand and cement are to be mixed together dry and sufficient water added to thoroughly wet the same, after which the lime mortar is to be added and the whole mass is then to be thoroughly tempered. All other tile work is to be laid in mortar composed as follows: One (1) part Louisville, Rosendale, or other natural cement, three (3) parts sharp sand and one part lime mortar, thoroughly mixed in the manner before described. All tile must be laid with full flush joints, plumb, to a line, with horizontal beds uniformly level on each course. Fill all the joints, chinks and crevices between the tile and steel work with mortar well slushed in.

BEAM TILE.—The soffits of all beams to be protected with slabs of tile at least 1 inch in thickness. If more than one inch, the beam tile must be made with air space next to beam.

MINOR ROOFS.—The roofs of pent houses, roof over projecting portion in second story, floor of bulkheads, and other portions indicated on details as book-tile shall be made of three-inch (3 in.) book-tile set in place between tee-irons. Tee-irons to be furnished by the iron contractor.

PARTITIONS.—All partitions shown on the plans to be built the thickness indicated in figures. If no dimensions are given, the following sizes will govern:

Partitions for all corridors and for partitions over 12 feet and up to 14 feet in height to be 4 inches. Partitions over 14 feet in height to be 6 inches, and all cross partitions 12 feet or less to be 3 inches. Partition walls to be built straight, true, plumb and well bonded with proper "breakjoint" bond on each alternate course, and all joints thoroughly flushed up with mortar, and to be well wedged underneath.

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FURRING TILE.—Where indicated on plans, 2 inch furring tile are to be built against the outside walls of the building. These tiles are to be secured to the brick walls with 10d spikes on every third course, driven into the brickwork at intervals not greater than 48 inches apart.

CURB WALL.—The curb wall in basement shall be furred with three-inch (3 in.) tile extending up to the under side of the iron plate along edge of curb wall and properly fitting around all beams.

ROUGH FRAMES AND BLOCKS.—The contractor for carpenter work will furnish and erect the rough wood frames at all openings in partitions and furring. He will also furnish all wooden blocks necessary to form nailing facilities for attaching plaster grounds, etc. These blocks must be built in place by fireproofing contractor wherever directed by the architect.

COLUMN COVERING.—All column covering shall start, in all cases, directly from the tile arches of floor. Column covering shall be designed to properly fit the columns.

All corners of square columns shall be left square or round. Column covering to be wired on once or twice in each course in height or secured together with clamps.

COVERING EXPOSED STEEL WORK.—All girders, beams, channels, etc., that show below the under side of ceilings are to be encased on all sides with at least 1-inch thickness of fire-proof tile secured to the steel in the usual manner. If required, special designs must be submitted to the architect.

BOXES FOR PLUMBING PIPES.—All soil, vent, down spout and water supply pipes shall be boxed in, using three-inch (3 in.) tile, starting from the floor tile in all cases. This boxing shall not be done until the pipes have been properly tested, and covered by another contractor. There shall be no openings into boxes except for outlets on the various floors. Where these outlets occur small wood frames furnished by carpenter shall be set by the fireproofing contractor.

BULKHEADS.—All bulkheads of first and second floor shall be built of 3-inch tile; the structural iron contractor furnishing all necessary tee-irons for the support of the tile. See details for bulkhead treatment, and iron drawings for the supports.

Provide three-inch (3 in.) tile for the ends of bulkheads where intersected by the entrance doors.

TOILET ROOM FLOORS.—All toilet room floors where shown on plans shall be raised approximately one foot with fireproofing. Supports to be so arranged as not to interfere with the piping of these rooms.

PENT HOUSES.—The contractor shall build the walls of pent houses with four-inch (4 in.) hard or glazed tile, laid up in Portland cement mortar, all joints to be thoroughly flushed up.

Curbs of all skylights shall be built of four-inch tile.

FLOOR STRIPS AND CONCRETE FILLING.—After the floor arches have been set in place, and at such times as may be designated by the architect, the contractor for carpenter's work will furnish and set the 2x3-inch wood floor strips required as nailing ground for the finished wood flooring, where wooden flooring is called for.

After the strips have been set, the fireproofing contractor must fill in between the same with concrete filling; this concrete is to be composed of one (1) part American Portland Cement, of approved brand, two (2) parts sharp sand, and six parts broken tile, stone, gravel or fine, clean coal cinders, thoroughly mixed together dry, then tempered and mixed, and tamped in place. In no case shall cinder concrete be allowed to come in contact with structural steel.

FINALLY.—Do everything necessary to finish the entire work in a thorough and substantial manner. Remove promptly from the premises all the tools, scaffolding, unused tile, debris, etc., as soon as the work is completed.

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# RULES OF MEASUREMENT FOR EXCAVATION AND CONCRETE WORK.

The following rules have been carefully studied and analyzed by a joint committee consisting of five (5) members of the Chicago Architects Business Association, five (5) members of the Western Society of Engineers, and five (5) members of the Contractors' and Masons' Association of Chicago.

If any new rules or new applications of old rules should be found in the following, we can only say for their recommendation that we have carefully considered them in all their bearings, endeavoring to secure equal justice to owner as well as contractor, and that they will form the standard for deductions as well as for compensation for extra work.

### EXCAVATION OF CELLARS AND BASE-MENTS.

1. Excavation to be measured and computed by the actual amount of material displaced. If unit price is based upon loose measurement add forty (40%) per cent to actual bank measurement, except if consisting of sand and gravel, when only twenty (20%) per cent will be added. If rehandling becomes necessary, same to be done at a special price agreed upon in addition to the above.

### EXCAVATION OF TRENCHES AND PITS.

2. Excavation of trenches, pier holes, or pits when more than 3' wide to be computed on actual contents when less than five (5') ft. deep.

When less than three feet wide excavation of trenches, pier holes, or pits to be computed on actual contents if less than two (2') feet deep.

If more than two feet (2') deep compute contents of trench on base of three foot (3') width, even though same is narrower.

If less than two (2') feet in depth estimate actual width.

For pits or pier holes more than two (2') feet deep and less than twelve (12) square feet in area estimate area of same on base of twelve (12) square feet multiplied by depth of same down to five (5') foot, and if more than five (5') feet deep estimate on same basis as given below for additional depth of trenches, with the same percentages of increases added.

Add 75% to actual contents of excavation of trenches, pier holes, or pits for depth between five (5') ft. to ten (10') ft.

Add 150% to actual contents of excavation of trenches, pier-holes, or pits, for depth between ten (10') ft. and fifteen (15') feet.

Add 225% to actual contents of excavation of trenches, pier holes, or pits for depth between fifteen (15') feet and twenty(20') feet.

Add 300% to actual contents of excavation of trenches, pier holes, or pits for depth between twenty (20') feet and twenty-five (25') feet

Add 375% to actual contents of excavation

of trenches, pier holes, or pits between twenty-five (25') feet and thirty (30') feet in depth.

Add 450% to actual contents of excavation of trenches, pier holes, or pits between thirty (30') feet and thirty-five (35') feet in depth, and so on, adding 75% accumulative for every five (5') feet additional depth.

### BACK FILLING AND GRADING.

Soil required for back filling or grading to be measured by computing from cross-sectioning cubic contents of area to be filled or graded.

### SHEET PILING.

4. Sheet piling and lagging to be estimated per thousand feet of lumber required. Kind of lumber to be specified.

### SHORING OF EARTH BANKS.

5. Shoring of earth banks to be done at unit price, per square foot of shored surface of bank.

### DRAINING.

**6.** Pumping or bailing when required to be done at special price, in addition to excavation unit price, as the excavation rules are based on dry work: this, however, does not apply to rain or storm water.

### CONCRETE FOUNDATIONS.

7. Foundations for walls to be measured actual contents when made with square and level off-sets.

Footings with sloping or beveled off-sets less than 30% from the horizontal multiply area of base by greatest height of footing. This applies to piers also, except when courses in pier foundations are less than twelve (12') feet in area, when one (1) cubic foot will be added for each corner for every foot in height of such course.

8. Foundations for all projections such as chimney breasts, pilasters, buttresses, or flues connected with walls to be measured actual contents contained therein, and one cubic foot added thereto for each corner for every foot in height.

9. Recesses and slots in foundations to be measured solid and in addition thereto allow two (2) cubic feet for every foot in height or length.

10. Arches in foundation, Multiply length of chord at spring of arch by height from chord to extrados by thickness of arch, and add to the wall measurement. Height of arching equal to thickness of wall.

### CIRCULAR OR POLYGON FOUNDATIONS.

11. Circular or polygon foundations to be figured at double actual contents.

# EXTERNAL, DIVISION AND INTERIOR CONCRETE WALLS.

12. For walls fourteen (14) feet or less in height, twenty-four (24) inches or more in thickness, use the actual thickness as basis in computing the volume. For walls less than twenty-four (21) inches in thickness, add one-half the difference between the actual thickness and twenty-four (21) inches in computing the volume. If walls



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are more than fourteen (14) feet in height between floors add to cubic contents fifteen (15) per cent for every additional four (4) feet in height, on accumulative scale, as given for trench excavation.

### CIRCULAR WALLS.

13. For circular walls of radius sufficiently large to obviate the necessity of using specially prepared lumber for forms, add one-fifth (1-5) of length to girt of wall, and figure cubic contents on the same basis as prescribed for External and Division Walls, Paragraph 12.

### BATTERED WALLS.

14. For battered, or sloping walls estimate contents on same basis as for external and division walls, and add one-half (½) of contents of wedge, or batter to same when narrower on top than twenty-four (24") inches. See Paragraphs 12 and 17.

### INTERSECTION OF WALLS.

Intersection of division walls twenty-four (24) inches thick or less (bonded together in any manner not abutting) to be measured as slot or recess. When thicker add (1) one foot to length of wall for every intersection when measuring.

### RETAINING WALLS.

15. In retaining walls reinforced with beams, columns, or girders figure concrete casing a minimum thickness of twelve (12") inches from outside edge of steel on side next to earth bank and six (6") inches from outside edge of steel on opposite side—i. e. compute wall one foot, six inches (1'-6") thicker than width of steel.

For all other retaining walls compute on same basis as for external or internal walls, paragraphs twelve (12) and seventeen (17.)

No deduction in cubic contents of concrete to be made for metal imbedded in same.

### HOLLOW WALLS.

16. Hollow walls to be at special rates.

### CORNERS.

17. For each corner of wall more or less than ninety (90) degrees add one foot, six inches (1'-6") to girt length of walls in measuring.

The term corner is used for salient angles of walls, and angle for re-entering angles.

### PILASTERS, ETC.

18. All plain projections, such as chimney breasts, piers connected with walls and pilasters to be measured actual contents contained therein, and one (1) cubic foot added for each corner for every foot in height.

### FIERS.

19. Independent plain square piers to be measured by the same rule, i. e. add one cubic foot for each corner for every foot in height. For plain polygon or round piers, add four (4) cubic feet for each foot in height

### RECESSES.

20. Recesses and slots to be measured solid and in addition thereto allow two (2) cubic feet for every foot in height or length.

### ARCHES.

21. In Vaults: multiply length of chord at spring of arch by height from chord to extrados by thickness of arch.

In walls: find contents of arch by same rule and add same to wall measurement, as called for in paragraph ten (10).

In sewers and tunnel arches: multiply length of extrados by thickness of arch.

### OPENINGS WITH FRAMES BUILT IN.

22. Deduct contents of windows, doors and other openings, measuring from jamb to jamb and from top of sill to spring of arch, and add two (2) feet of wall for each jamb for every foot in height of opening when plank frames are used; if box frames are used add four (4) feet of wall for each jamb for every foot in height.

### OPENINGS WITHOUT FRAMES.

23. Deduct contents of openings, same to be measured from top of sill to spring of arch and shortest distance between concrete jambs for width, and add for each jamb two (2) feet of wall for every foot in height of opening.

Circular, oval or other special shaped openings to be figured at special price.

### CHIMNEY BREASTS, FLUES AND PILASTERS.

24. All flues and hollows in chimneys or walls less than two (2) feet in area, figure solid and add two (2) cubic feet for every foot in height. All flues and hollows in chimneys or walls from two (2) feet to four (4) feet in area to be measured solid. When larger, deduct one-half (½) of contents of flue.

Detached portions of chimneys in buildings and plain chimney tops above roof to be measured solid, and one (1) cubic foot to be added for each corner for every foot in height.

### DETACHED STACKS.

25. Detached chimney stacks to be figured at special rates.

### TRIMMINGS.

26. No deductions allowed for omissions of concrete for cut-stone, terra cotta or other trimmings, bond blocks, timber, joists or lintels.

All ornamental or moulded work in cornices, gutters, belt or sill courses, etc., to be figured at special rates.

### CUTTING AND PATCHING.

27. Cutting and patching of joists, girders, or other holes, slots, panels, recesses, etc., to be paid for on basis of time and material required.

### TOOTHING.

28. When ordered by the Owner, Architect, Engineer, or the Superintendent in charge of the work, to rack or block in consequence of delay of delivery of iron, steel, stone, terra cotta, or other material, that concrete work may connect with such racking or blocking shall be measured as extra work, as follows: Increase girt length of such line by one-half (½) and multiply by thickness of wall.

### CONCRETE FLOORS ON SOIL AND TILE ARCHES.

29. Floors to be measured by the superficial surface between outside walls of building. No deduction to be made for floor sleepers, conduits, pipes, drains, division or partition walls. No deduction to be made for any piers, columns, chimney breasts, pilasters or other projections of walls of ten (10') feet or less in area.

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### CAISSONS.

30. Owing to grillage in caissons being left at different heights in same building, unit price for caissons will be computed on excavated contents, including necessary wood-lagging and rings for same. Cubic contents of excavation of caissons to be computed from top of first set of lagging to bottom of caissons and from outside to outside of lagging. If steel or other special casing is required same to be paid for additional, at special unit price per pound.

### BELLS.

31. Area of bottom of bell to be multiplied by height of bell to neck for cubic contents.

32. For Caissons 7' 0" or more in diameter estimate actual contents from outside to outside of lagging.

For Caissons from seven to six ft. six inches inclusive add 5% to actual contents.

For Caissons under six feet six inches to six feet inclusive, add 15% to actual contents.

For Caissons under six feet to five feet six inches inclusive, add 25% to actual contents.

For Caissons under five feet six inches to five feet inclusive, add 35% to actual contents

For Caissons under five feet add fifty per cent (50%) to actual contents.

33a. If compressed air is required, same to be paid for in addition to the above.

33. If rings are ordered left in caissons, same to be paid for additional at unit price per pound.

34. Pumping and bulkheading to be paid for at additional price.

35. No deduction to be made for cubic contents of metal imbedded in concrete.

### CONCRETE FILLING IN CAISSONS.

36. Concrete for filling of caissons to be computed on actual contents per cubic foot of concrete, but no deduction to be made for any metal imbedded in same.

### REINFORCED CONCRETE WORK.

37. Reinforced Walls:

Compute concrete on same basis as specified in Sections 12 and 17, for external and division walls, and add to same cost of reinforcing metal put in place. If through changes or revisions cutting of reinforcing metal delivered or ordered becomes necessary, estimate the full length of such bars or metal fabric, and add to same cost of cutting and fitting required. Reinforcing metal to be computed on unit price per pound or square foot. No deductions to be made in estimating cubic contents of concrete for any metal imbedded in same, such as wire netting, expanded metal, bars, beams, columns, etc.

### COLUMNS.

38. Measuring of plain uniform size columns to be covered by the foregoing paragraph 19 relating to piers.

39. Capitals, caps, brackets, panels, mouldings or other ornamental or moulded work to be figured special rate.

# GIRDERS, FLOOR BEAMS OR OTHER DROP PROJECTIONS BELOW FLOOR SLAB.

40. For projections named in this paragraph add for each corner and angle to cubic

contents one (1) cubic foot for each foot in length. For each chamfered or rounded corner or angle add one-half (½) cubic foot for each foot in length in addition to the above.

### FLOOR SLABS.

41. Floor and roof slabs to be estimated on same basis as called for in paragraph 29 for floors on soil, and at a minimum thickness of six (6) inches. Less than six (6) inches in thickness will be computed as six (6) inches

### OPENINGS.

42. No deductions to be made in floor area for openings of less than twenty (20) square feet. For larger openings after deducting full area of opening, add one (1) superficial foot to floor area for each foot in length of girt of opening, and one (1) CUBIC FOOT extra for each corner or angle.

### DEPRESSIONS.

43. For pits, baskets or other depressions in floor, add one superficial foot to the area of walls and floors of same for each foot in length of each corner and angle.

# SETTING OF FACIAS, FRAMES, PIPES, SLEEVES, BOLTS, RODS, CLAMPS, ETC.

44. Setting of facias, frames, pipes, sleeves, bolts, rods, clamps, etc., imbedded in concrete to be paid for additional at special price.

### FLOOR BASE AND COVES.

- 45. Floor base and coves to be estimated at special price per lineal ft. with one foot added to length of same for each corner and angle. For base or cove around round columns estimate three (3) times girt of column and for square or polygon columns add one foot for each corner to girt of same.
- 46. Concrete stairs to be estimated square foot area of face of treads and risers. Stair-landings and platforms between floors to be same unit price per foot as stairs.
- 47. Curbs and roofs or skylights to be estimated on same basis as called for in sections 40 and 41 except that quantities for same shall be doubled.
- 48. Sidewalks laid on soil or tile and brick arches, to be estimated as floor-slab section 29 with special unit price.

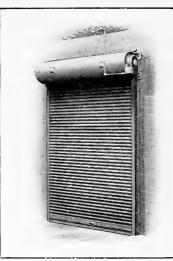
Sidewalks reinforced to be estimated same as called for in sections 40 and 41 with special unit price.

Curbs to be estimated per lineal foot at special unit price.

Driveways to be estimated square foot area at special unit price.

(Signed)

H. B. Wheelock,
Thomas H. Mullay,
Joseph C. Lewellyn,
L. G. Hallberg,
Arthur Woltersdorf,
Joachim G. Giaver,
Louis E. Ritter
Alexander C. Warren,
W. S. Shields,
E. E. Grant,
A. Lanquist,
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E. F. Pierce,
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# STRUCTURAL MATERIALS—CEMENT AND STEEL, AND SPECIFICATIONS THEREFOR.

BY ROBERT W. HUNT.

Tremendous strides were made in the sciences during the 19th century. Chemistry and physics particularly had their share of attention; and perhaps the more because of the recognized application which they bore to the manufacturing and commercial development of the time. History finds no parallel to the record of inventions and discoveries of that century. nearly all of which have been fostered and nourished to a tremendous degree of everyday use. Almost as soon as an invention was made, scientists set about to conquer its difficulties; chemists and physicists discovered new laws, grasped new opportunities and strove with one another in the endeavor to advance the world's material prosperity. In close company with the chemists and physicists came the mathematicians, who, by the new application of their formulae, laid the foundation on which the inventive genius saw his ideas raised to higher and more productive heights.

To mention the noteworthy discoveries of the 19th century or to trace the development of even one of them, is a matter of much greater record than is possible here. Sufficient must be the thought of how the world's infant industries of former days compare with the giants of today; and reflection then will show how the application of chemistry, physics and mathematics, made the won-

derful growth possible.

Is there wonder, therefore, that because men built, even if in crude and awkward ways, they must know what of they built; and was it not a perfectly natural development in the order of things that a new branch of science termed "testing" found ready root in the rapidly increasing

activities of the world? Analyze the term testing as one may, and the fact remains undisputed that testing is only an attribute of the principal sciences mentioned; an outgrowth resulting perhaps from the inquisitive nature of the scientists and inventors of history. Granting that the foundation of testing is in the science of chemistry and physics, we today prefer to regard it almost as a science apart from the two; for the fact is that testing has become such an important subject as to make it one of special study in many ways. Therefore, if preferment exists for considering the subject of testing as a separate science, it might well be defined as that relating to the proving of matter.

It was probably in the dawn of the 19th century, when all the world was awakening to greater possibilities, that "testing" became a subject of special consideration. It is inconceivable that prior to that time there was no such thing as testing,

but it should be remembered that that was long before the time when steam and electricity began to work their wonders; and long in advance of the days when steel and cement were enormous articles of trade.

In 1812 Samuel Brown, having improved his ship chains by scarf welding, also introduced a machine, "which by enabling him to put as great a strain upon the cables as was likely ever to be brought upon them when in use, thus detected any defective materials or insufficient workmanship." This undoubtedly constituted the first real testing machine, and probably was the first effort to accord to purchasers the proof that materials were able to meet certain contemplated conditions. Brown's humble beginning founded a series of ample and worthy successors, and testing machines of all descriptions, not only for tension, but for compression and torsion, were eventually designed and built.

The advent of railroads and self-propelled vessels did much to hasten the development of the art of testing, because materials entering into the construction of machinery for such uses demanded the fulfillment of certain obligations, and care was therefore required in their selection. It was not, however, until the introduction of Bessemer and Open Hearth steels that testing began assume such importance and study as is now attached to it. The tremendous advance made when these materials of construction began to be literally dumped on to the world brought up many questions of strength and quality as related to safety, and to most of these engineers and architects looked to the testing machine and inspection for answer. chasers of materials found it necessary to specify their desires more than ever, and the art of testing assumed new and more important phases. The productions of steel for structural purposes did more perhaps than any one thing, to separate testing into two, more or less, distinct branches, viz: physical and chemical, for it was surely in connection with such manufacture that the science of chemistry began to be so intimately associated with the commercially structural side of life. Thus the field of testing was divided into the separate lines which, however, have ever since gone hand in hand.

The story is told that when the manufacture of steel rails was in its infancy, a rolling mill owner derided the first effort to restrict the chemical composition of the steel to certain limits, and remarked "that chemists would ruin the steel business yet." It is, however, related that the same mill proprietor employed, promoted, and finally made rich a man who explained



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to him what was moment of inertia.

The testing of materials has progressed step by step along the well defined laws of physics and chemistry, and following closely the manufacturing laws of supply and demand. It has been said of the manufacture of steel that quality was not opposed to quantity, but unquestionably, and by no means confined to steel, it is true that as the quantity of product has increased, so has the necessity of proving its quality increased; with the result that testing, as a science or art, has continually grown in importance. Testing has, in consequence, become associated with nearly every condition of life and assumed a breadth of action quite unanticipated in its early days. Recognizing the advantage of testing the direct products of manufacture like steel and cement, engineers, architects, and in fact men of other spheres, have caused application of the art to various other matters. In this way, testing, and particularly physical testing, has become a common attribute of the purchase of nearly every article of trade Tests of finished maand commerce. chinery, both steam and electrical, are as common today as tests of the materials entering into their construction. growth of the automobile industry in the last decade has opened new opportunities and greatly extended the demand for test-As an interesting development of ing. that industry, it may be mentioned that today the power of a large automobile plant is generated by the engines of the machines themselves while undergoing the tests to which they are submitted.

No attempt at portraying the evolution of the science and art of testing would be complete without mention being made of the field created in a purely commercial way for the testing engineer. It has become in fact a very important business undertaking, and inspecting and testing engineers have proven themselves to be a most valuable part of the world's commercial activity. So it is that the subject is not confined to narrow limits, but finds for its application many places in all walks of life. Of this no greater proof exists than shown by reference to the membership and the meritorious achievements of some of America's most progressive scientific societies, the American Society for Testing Materials, the American Society of Civil Engineers, and the American Railway Engineering Associa-Each of these societies, based on the investigations and recommendations of the appointed committees, have prepared and adopted specifications relating to structural materials.

The SPECIFICATIONS FOR CEMENT of the American Society for Testing Materials have been approved by the American Society of Civil Engineers and have been adopted by all of the leading architects and engineers of the United States.

The American Railway Engineering Association has formulated a specification for steel railway bridges which is representative of the best thought and most careful consideration of the railway engineers throughout the country. This specification has been revised and supplemented by Robert W. Hunt & Co., Engineers, to apply as a GENERAL SPECIFICATION FOR STRUCTURAL STEEL FOR BUILDINGS and in this or similar form has been used by some of the most prominent engineers and architects.

The specifications for cement referred to, and the specifications for structural steel for buildings noted, have been assembled and are given in the following:

**GENERAL OBSERVATIONS.**—These remarks have been prepared with a view of pointing out the pertinent features of the various requirements and the precautions to be observed in the interpretation of the results of the tests.

The Committee would suggest that the acceptance or rejection under these specifications be based on tests made by an experienced person having the proper means for making the tests.

SPECIFIC GEAVITY.—Specific gravity is useful in detecting adulteration. The results of tests of specific gravity are not necessarily conclusive as an indication of the quality of the cement, but when in combination with the results of other tests may afford valuable indications.

FINENESS.—The sieves should be kept thoroughly dry.

TIME OF SETTING.—Great care should be exercised to maintain the test pieces under as uniform conditions as possible. A sudden change or wide range of temperature in the room in which the tests are made, a very dry or humid atmosphere and other irregularities vitally affect the rate of setting.

**CONSTANCY OF VOLUME.**—The test for constancy of volume are divided into two classes, the first normal, the second accelerated. The latter should be regarded as a precautionary test only, and not infallible.

So many conditions enter into the making and interpreting of it that it should be used with extreme care.

In making the pats the greatest care should be exercised to avoid initial strains due to molding or to too rapid trying out during the first twenty-four hours. The pats should be preserved under the most uniform conditions possible, and rapid changes of temperature should be avoided.

The failure to meet the requirements of the accelerated tests need not be sufficient cause for rejection. The cement may, however, be held for twenty-eight days, and a retest made at the end of that period, using a new sample. Failure to meet the requirements at this time should be considered sufficient cause for rejection, although in the present state of our knowledge it cannot be said that such failure necessarily indicates

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unsoundness, nor can the cement be considered entirely satisfactory simply because it passes the tests.

### SPECIFICATIONS.

### All Cement Shall Be Inspected.

Cement may be inspected either at the place of manufacture or on the work.

In order to allow ample time for inspecting and testing, the cement should be stored in a suitable weather-tight building having the floor properly blocked or raised from the ground.

The cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment.

Every facility shall be provided by the Contractor for a period of at least twelve days, allowing for the inspection and necessary tests.

Cement shall be delivered in suitable packages, with the brand and name of manufacturer plainly marked thereon.

A bag of cement shall contain 94 pounds of cement net. Each barrel of Portland cement shall contain four bags, and each barrel of natural cement shall contain three bags of the above net weight.

Cement failing to meet the seven-day requirements may be held awaiting the results of the twenty-eight-day tests before rejection

All tests shall be made in accordance with the methods proposed by the Committee on Uniform Tests of Cement of the American Society of Civil Engineers, presented to the Society January 21, 1903, and amended January 20, 1904, and January 15, 1908, with all subsequent amendments thereto.

The acceptance or rejection shall be based on the following requirements:

### PORTLAND CEMENT.

**DEFINITION.**—This term is applied to the firely pulverized product resulting from the calcination to incipient fusion of an intimate mixture of properly proportioned argillaceous and calcareous materials, and to which no addition greater than 3 per cent has been made subsequent to calcination.

**SPECIFIC GKAVITY.**—The specific gravity of cement shall not be less than 3.10. Should the test of cement as received fall below this requirement, a second test may be made upon a sample ignited at a low red heat.

The loss in weight of the ignited cement shall not exceed 4 per cent.

**FINENESS.**—It shall leave by weight a residue of not more than 8 per cent on the No. 100, and not more than 25 per cent on the No. 200 sieve.

NOTE.—The coarser particles of cement are not hydraulic in their properties, although they may not differ in chemical composition from the finer portion. It is in the infinitesimally fine material that the strength lies, and the more finely the cement is ground the greater its sand-carrying capacity. In a mixture of sand and cement, to obtain the highest strength each particle of sand should be covered with cement, consequently a large percentage of material passing the 200 mesh

sieve is desirable. A high neat strength would be obtained from a cement in which the particles were of a variety of sizes, but this same cement would not show as high a test with sand as though it were finely ground.

TIME OF SETTING.—It shall not develop initial set in less than thirty minutes; and must develop hard set in not less than one lour, nor more than ten hours.

NOTE.—The purpose of these tests is to determine whether or not, when mixed into mortar or concrete, the cement is liable to set before the material is in its place in the work. Sand retards the set, as does also cold weather and cold water. Concrete should not be disturbed after the cement has had its initial set, but when a cement is reported as having an initial set, say of thirty minvtes, it is safe to assume that the concrete will require a longer time than thirty minutes before setting occurs. A tester is frequently able to pass a cement which does not comply with the setting requirements, if he is conversant with the work in which it is to be used, how soon it is to be put in place, etc.

**TENSILE STRENGTH.**—The minimum requirements for tensile strength for briquettes one square inch in cross section shall be as follows, and the cement shall show no retrogression in strength within the periods specified:

### NEAT CEMENT.

### 1 PART CEMENT, 3 PARTS STANDARD OTTAWA SAND

7 days (1 day in moist air, 6 days

A pat is then kept in air at normal temperature and observed at intervals for at least 28 days.

Another pat is kept in water maintained as near 70 degrees F, as practicable, and observed at intervals for at least 28 Jays.

A third pat is exposed in any convenient way in an atmosphere of steam, above boiling water, in a loosely closed vessel, for two hours.

These pats, to satisfactorily pass the requirements, shall remain firm and hard and show no signs of distortion, checking, cracking or disintegrating.

SULPHURIC ACID AND MAGNESIA.—
The cement shall not contain more than 1.75 per cent of anhydrous sulphuric acid (SO3), nor more than 4.00 per cent of rangaesia (Mg0).

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GENERAL SPECIFICATIONS FOR STEEL RAILWAY BRIDGES, 1910. REVISED AND SUPPLEMENTED BY

ROBERT W. HUNT. ENGINEER.

TO APPLY AS

### GENERAL SPECIFICATIONS FOR STRUCTURAL STEEL FOR BUILDINGS.

### MATERIAL.

### Steel:

85. Steel shall be made by the open hearth process.

### Properties:

86. The chemical and physical properties shall conform to the following limits:

### Structural Steel:

Phosphorus	maxim	um	Basic Acid	
Sulphur Ultimate st Elongation		(desir minim		.05 % 60000 # 1500000

ult. strength 180 deg. flat Cold bend Character of fracture Silky

Pagio A10

### Rivet Steel:

Phosphorus	maximum	Acid	.04%
Sulphur	**		.04%
Ultimate st	rength (desi	red)	50000 #
Elongation	in 8" minin	ium	1500000

ult, strength 180 deg. flat Cold bend Silky Character of fracture

### Steel Castings:

Phosphorus maximum	Basic .05%
-14	Acid .08%
Sulphur "	.05%
Ultimate strength not 1	
Elongation in 8" minin	
Cold bend over 3 diam	
Character of fracture	silky or fine granular.

\*See paragraph 96.

'See paragraphs 97 and 99.

"See paragraph 100.

The yield point, as indicated by the drop of beam, shall be recorded in the test reports.

### Allowable Variations:

88. If the ultimate strength varies more than 4,000 lbs. from that desired, a retest shall be made on the same gage, which, to be acceptable, shall be within 5,000 lbs, of the desired ultimate.

### Chemical Analysis:

89. Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the architect or engineer or his inspector. Check analysis shall be made from finished material, if called for by the architect or engineer, in which case an excess of 25 per cent above the required limits will be permitted.

### Specimens:

Plate, shape and bar specimens for tensile and bending tests shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to the form shown by Fig. 1; or with both edges parallel; or they may be turned to a diameter of 34 in, for a length of at least 9 in, with enlarged ends.

Rivet rods shall be tested as rolled.

93. For steel castings the number of tests will depend on the character and importance of the castings. Specimens shall be cut cold frem coupons molded and cast on some portion of one or more castings from each melt or from the sink heads, if the heads are of sufficient size. The coupon or sink head so used, shall be annealed with the casting before it is cut off. Test specimens to be of the form Fig. 2.

93-A. Steel castings shall be true to pattern, free from shrinkage cracks, blow holes, or other injurious defects, and shall be thoroughly annealed.

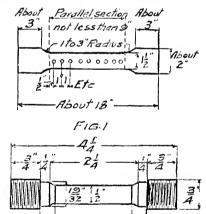


FIG. 2

### Specimens of Rolled Steel:

94. Rolled steel shall be tested in the condition in which it comes from the rolls.

### Number of Tests:

At least one tensile and one bending test shall be made from each melt of steel as rolled. In case steel differing % in, and more in thickness is rolled from one melt, a test shall be made from the thickest and thinnest material rolled,

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### Modification in Elongation:

96. A deduction of 1 per cent will be allowed from the specified percentage of elongation, for each ½ in. in thickness above ¾ in.

### Bending Tests:

97. Bending tests may be made by pressure or by blows. Plates, shapes and bars less than one inch thick shall bend as called for in paragraph 84.

### Bending Angles:

99. Angles  $\frac{34}{4}$  in, and less in thickness shall open flat, and angles  $\frac{1}{2}$  in, and less in thickness shall bend shut, cold, under blows of a hammer, without sign of fracture. This test shall be made only when required by the inspector.

### Nicked Bends:

100. Rivet steel, when nicked and bent around a bar of the same diameter as the rivet rod, shall give a gradual break and a fine silky uniform fracture.

### Finish:

101. Finished material shall be free from mjurious seams, flaws, cracks, defective edges or other defects, and have a smooth, uniform and workmanlike finish. Plates 36 in. in width and under shall have rolled edges.

### Melt Numbers:

102. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it. Rivet and lattice steel and other small parts may be bundled with the above marks on an attached metal tag.

### Defective Material:

103. Material which, subsequent to the above tests at the mills, and its acceptance there, develops weak spots, brittleness, cracks or other imperfections, or is found to have injurious defects, will be rejected at the shop and shall be replaced by the manufacturer at his own cost.

### Variation in Weight:

104. A variation in cross-section or weight of each piece of steel of more than 2½ per cent from that specified will be sufficient cause for rejection, except in case of sheared plates, which will be covered by the following permissible variations, which are to apply to single plates, when ordered to weight:

- 105. Plates 12½ lbs. per sq. ft. or heavier:
  - (a) Up to 100 in. wide, 2½ per cent above or below the prescribed weight.
  - (b) One hundred inches wide and over, 5 per cent above or below.
- 106. Plates under 12½ lbs. per sq. ft.:
  - (a) Up to 75 in. wide,  $2\frac{1}{2}$  per cent above or below.
  - (b) Seventy-five inches and up to 100 in. wide, 5 per cent above or 3 per cent below.
  - (c) One hundred inches wide and over, 10 per cent above or 3 per cent below

107. Plates when ordered to gage will be accepted if they measure not more than 0.01 in, below the ordered thickness.

108. An excess over the nominal weight, corresponding to the dimensions on the order, will be allowed for each plate, if not more than that shown in Manufacturer's Standard Table for overweight, one cubic inch of rolled steel being assumed to weigh 0.2833 lbs.

### Cast Iron:

109. Except where chilled iron is specified, casting shall be made of tough gray iron, with sulphur not over 0.10 per cent. They shall be true to pattern, out of wind and free from tlaws and excessive shrinkage. Tests shall be made on the "Arbitration Bar" of the American Society for Testing Materials, which is a round bar 1½ in. in diameter and 15 in. long. The transverse test shall be made on a supported length of 12 in. with load at middle. The minimum breaking load as applied shall be 2,900 lbs., with a deflection of at least 1/10 in. before rupture.

### Wrought Iron:

110. Wrought iron shall be double rolled, tough, fibrous and uniform in character. It shall be thoroughly welded in rolling and be free from surface defects. When tested in specimens of the form of Fig. 1, or in full sized pieces of the same length, it shall show an ultimate strength of at least 50,000 lbs, per sq. in., an elongation of at least 18 per cent in 8 in., with fracture wholly fibrous. Specimens shall bend cold with the fibre, through 135 degrees, without sign of fracture, around a pin the diameter of which is not over twice the thickness of the piece tested. When nicked and bent, the fracture shall show at least 90 per cent fibrous.

### INSPECTION AND TESTING AT THE MILLS.

### Will Orders:

111. The Architect or Engineer shall be furnished complete copies of mill orders, and no material shall be rolled nor work done before the purchaser has been notified where the orders have been placed, so that he may arrange for the inspection.

### Facilities for Inspection:

112. The Manufacturer shall furnish all facilities for inspecting and testing the weight and quality of all material at the mill where it is manufactured. He shall furnish a suitable testing machine for testing the specimens, as well as prepare the pieces for the machine, free of cost.

### Access to Mills:

113. When an inspector is appointed by the Architect or Engineer to inspect material at the mills, he shall have full access, at all times, to all parts of mills where material to be inspected by him is being manufactured.

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### Duties of Mill Inspector:

113a. It shall be the duty of the inspector to make or witness all of the required physical tests and to obtain from the munufacturer certified copies of all the required chemical analysis. He shall make complete reports to the Architects or Engineer of all tests and analyses and state if the material represented by the same is accepted or rejected.

113b. He shall make a surface inspection of all material and identify the melt or cast numbers of same.

113c. All material from mosts or casts rejected on tests and all material found defective shall be rejected while all material from accepted melts and free from defects will be accepted and the Inspector will place his stamp of acceptance on such materials.

113d. The Inspector will make complete reports to the Architects or Engineers of all materials he has inspected, these reports to include the melt number on all items. These reports will show what has been accepted and what has been rejected.

### WORKMANSHIP.

### General:

114. All parts forming a structure shall be built in accordance with approved drawings. The workmanship and finish shall be equal to the best practice in modern bridge works. Material arriving from the mills shall be protected from the weather and shall have clean surfaces before being worked in the shops.

### Straightening:

115. Material shall be thoroughly straightened in the shop, by methods that will not injure it, before being laid off or worked in that way.

### Finish:

116. Shearing and chipping shall be neatly and accurately done and all portions of the work exposed to view neatly finished.

### Size of Rivets:

117. The size of rivets, called for on the plans, shall be understood to mean the actual size of the cold rivet before heating.

### Rivet Holes:

118. When general reaming is not required, the diameter of the punch shall not be more than 1/16 inch greater than the diameter of the rivet; nor the diameter of the die more than 1/16 inch greater than the diameter of the punch. Material more than 34 inch thick except "I" beams shall be subpunched and reamed or drilled from the solid. Punching:

119. Punching shall be accurately done. Drifting to enlarge unfair holes will not be allowed. If the holes must be enlarged to admit the rivet, they shall be reamed. Peor matching of holes will be cause for rejection.

119a. All holes in field connections of columns to columns to be drilled to an iron templet or reamed after the connecting parts are assembled.

119b. All bolt holes in cast iron bases and columns are to be accurately drilled.

### Reaming:

120. Where sub-punching and reaming are required, the die used shall have a diameter at least 1/18 inch smaller than the nominal diameter of the rivet. Holes shall then be reamed to a diameter not more than 1/16 inch larger than the nominal diameter of the rivet.

### Reaming After Assembling:

121. (When general reaming is required it shall be done after the pieces forming one built member are assembled and so firmly bolted together that the surfaces shall be in close contact. If necessary to take the pieces apart for shipping and handling, the respective pieces reamed together shall be so marked that they may be reassembled in the same position in the final setting up. No interchange of reamed parts will be permitted.)

122. Reaming shall be done with twist drills.

123. The burrs on reamed holes shall be removed.

### Assembling:

124. Riveted members shall have all parts well pinned up and firmly drawn together with bolts, before riveting is commenced. Contact surfaces to be painted. (See 152.)

### Lattice Bars:

125. Lattice bars shall have neatly rounded ends, unless otherwise called for.

### Web Stiffeners:

126. Stiffeners shall fit neatly between flanges of girders. Where tight fits are called for, the ends of the stiffeners shall be faced and shall be brought to a true contact bearing with the flange angles.

### Splice Plate and Fillers:

127. Web splice plates and fillers under stiffeners shall be cut to fit within  $\frac{1}{18}$  inch of flange angles.

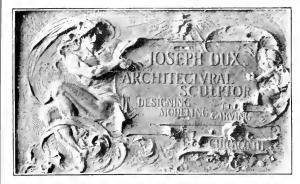
### Riveting:

130. Rivets shall be uniformly heated to a light cherry red heat in a gas or oil furnace so constructed that it can be adjusted to the proper temperature. They shall be driven by pressure tools wherever possible. Pneumatic hammers shall be used in preference to hand driving.

131. Rivets shall look neat and finished, with heads of approved shape, full and of equal size. They shall be central on shank and grip the assembled pieces firmly. Recupping and calking will not be allowed. Loose, burned or otherwise defective rivets shall be cut out and replaced. In cutting out rivets, great care shall be taken not to injure the adjacent metal. If necessary, they shall be drilled out,

### Turned Bolts:

132. Wherever bolts are used in place of rivets which transmit shear, the holes shall be reamed parallel and the bolts shall make a driving fit with the threads entirely outside of the holes. A washer not less than <sup>1</sup><sub>4</sub> inch thick shall be used under nut.



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### Members to be Straight:

133. The several pieces forming one built member shall be straight and fit closely together, and finished members shall be free from twists, bends or open joints.

### Finish of Joints:

134. Abutting joints shall be cut or dressed true and straight and fitted close together, especially where open to view. In compression joints, depending on contact bearing, the surfaces shall be truly faced, so as to have even bearings after they are riveted up complete and when perfectly aligned.

### Screw Threads:

141. Serew threads shall make tight fits in the nuts and shall be V. S. standard, except above the diameter of  $1^3\mathrm{s}$  inches, when they shall be made with six threads per inch.

### Annealing:

142. Steel, except in minor details, which has been partially heated, shall be properly annealed.

### Welds:

144. Welds in steel will not be allowed.

### Field Rivets:

147. Field rivets shall be furnished to the amount of 15 per cent plus ten rivets in excess of the nominal number required for each size.

### Shipping Details:

148. Pins, nuts, bolts, rivets and other small details shall be boxed or crated.

### Weight:

149. The scale weight of every piece and box shall be marked on it in plain figures.

### Finished Weight:

150. Payment for pound price contracts shall be by scale weight. No allowance over 2 per cent of the total weight of the structure as computed from the detail plans will be allowed for excess weight.

### SHOP PAINTING.

### Cleaning:

151. Steel work, before leaving the shop, shall be thoroughly cleaned and given one good coating of pure linseed oil, or such paint as may be called for, well worked into all joints and open spaces.

### Contact Surfaces:

152. In riveted work, the surfaces coming in contact shall each be painted before being riveted together.

### Inaccessible Surfaces:

153. Pieces and parts which are not accessible for painting after erection shall have an additional coat of paint before leaving the shop.

### Condition of Surfaces:

154. Painting shall be done only when the surface of the metal is perfectly dry. It shall not be done in wet or freezing weather unless protected under cover.

### Machine Finished Surfaces:

155. Machine-finished surfaces shall be ceated with white lead and tallow before

shipment or before being put out into the open air.

## INSPECTION AND TESTING AT THE SHOPS.

### Facilities for Inspection:

156. The manufacturer shall furnish all facilities for inspecting and checking the weight and quality of workmanship at the shop where material is manufactured.

### Starting Work:

157. The Architect or Engineer shall be notified well in advance of the start of the work in the shop, in order that he may have an inspector on hand to inspect material and workmanship before it is painted or loaded on cars for shipment.

### Access to Shop:

158. When an Inspector is appointed by the Architect or Engineer he shall have full access, at all times, to all parts of the shop where material under his inspection is being manufactured.

### Accepting Material:

159. The Inspector shall stamp each piece inspected with a private mark. Any piece not so marked may be rejected at any time and at any stage of the work. If the Inspector through an oversight or otherwise, has accepted material or work which is defective or contrary to the specifications, this material no matter in what stage of completion may be rejected by the Architect or Engineer, regardless of all previous inspections, as the inspection is not intended to relieve this Contractor from responsibility, but is a measure of precaution against oversights and errors.

Any defective material which is rejected shall be removed and replaced by this Contractor at his own cost and he shall be further liable for all expense due to delay caused by such rejections.

159a. If this Contractor fails or refuses to replace such defective material as may be found at any stage of the work, or fails to make good mistakes due to workmanship, the owners or architects may go into the open market and purchase the necessary material and may order such work done and charge the cost of the material and work to this Contractor.

### Shop Plans:

160. The Architect or Engineers shall be furnished complete shop plans.

### Shipping Invoices:

161. Complete copies of shipping invoices shall be furnished to the Architect or Engineers with each shipment. These shall show the scale weights of individual pieces.

### Misfits:

161a. All misfits found during erection, which are due to errors in the shop, shall be promptly reported to the Superintendent, who in turn shall notify the Steel Contractor and the Steel Contractor shall make the arrangements for correcting such misfits and pay the expenses incidental thereto.



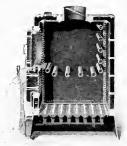
# KEWANEE WATER HEATING RBAGE BURN



DUBE PATENTS



### Type "A" Number Height Over All 58 inches 64 inches 61 inches Floor Space 22 inches 25 inches 30 inches Tank Connection 11% inches 2 inches 2 inches Smoke Connection 6 inches 8 inches 8 inches 6 to 12 Apartments Will Supply 2 to 3 3 to 6 List Price \$128.00 \$154.00 **\$200.00**



### Type "D" Number 33 34 35 36 37 38 39 40 Height Over All 56 in. 56 in. 56 in. 56 in. 56 in. 56 in. 35 x 47 $41 \times 59$ Floor Space 29 x 29 35 x 35 35 x 41 41 x 53 $27 \times 27$ 29 x 35 Tank Connection 2 in. 3 in. 3 in. 2 in. 216 in. 21/2 in. 2 in. 214 in. Smoke Connection 10 in. 10 in. 12 in. 12 in. Apartments Will 2 to 4 3 to 6 6 to 9 9 to 15 15 to 22 22 to 30 30 to 36 36 to 50 Supply List Price \$180.00 \$214.00 \$244.00 \$274.00 \$318.00 \$350.00 \$396.00

Garbage Burning Water Heaters of all makes, except the Kewanee as it is now constructed, char the garbage instead of burning it cleanly. The garbage is only attacked by fire and heat gases on the bottom, where in the Kewanee (By-Pass) the garbage is enveloped by fire and heat gases, thus destroying the odor. Impossible for garbage to smother the fire in a Kewanee. NOTE BY-PASS.

### Suggestions to Obtain Best Results

Bottom of tank should be as high as top of Garbage Burner.

Garbage Burner should be close to Tank as possible.

Pipe connections between Garbage Burner and Tank should be same size as openings in Garbage Burner. Smoke opening should not be reduced.

Breeching from Garbage Burner to chimney should be short as possible, with proper damper.

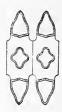
Garbage Burner should have independent smoke opening in chimney.

To determine size Garbage Burner required, divide number of rooms in building by (6) six. Please specify by NUMBER.



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For Steam and Water Heating.

Number	00	0	-	64	. u	4	- 20	9			9 10	11 0		12 13	77	15	16	17	18	19	30
Height of Brickwork in Height of Water Line Height of Water Line from fr. Floor Space   Length fr. and in.	63 77 4 8	83 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	55 88 50 50	69 86 54 57	69 10° 5°	55 25 25	75 111 5 5	124 0	81 11 11 6° 6°	821 122 124 125 126 126 126 126 126 126 126 126 126 126	81 69 141 69 69	87 65 131 14 68	87 65 147 6°	85 86 116 116 116 117	93 93 67 67 171 197 7* 78	103 187 82 82	103 75 211 82	109 80 191 8.8	109 112 88	115 87 19 <sup>5</sup> 9 <sup>2</sup>	115 87 215 92
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Square feet Fire Surface	2.25	3 30	120	138 154 5.0 6.33		186	8.0	8.8 8.8	259 9.5 11	304 11.0 12	348 393 448 502 548 647 12.5 12.5 14.5 16.0 18.6 20.6	393 44 12.5 14	448 14.5 16	502 54 16.0 18.	548 647 8.6 20.6	7 809 6 23.3	954 25.3	1041 25.8	1177 28.3	1268 30.8	1442 33 8
Diameter of Smoke-Pipe in. Size of Steam Supply. Size of Return.	51 52 cs	51 52 cs	16 2½	16 3 21 <u>c</u>	16 4 3	¥ → ∞	<del>2</del> 4 €	8 <u>1</u> + m	90 9 #	02 6 2	20 9 6 6 6 4 6 6	51 to #	51 to 4	57.5	27 27 27 27 27	202	8 - 2	#× 50	#8 9 8	စ္တ ∞ မ	2 × 2
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Boilers No. 15 and larger have two single Fire-Doors, and are made with Clinker Doors.

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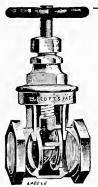
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# HINTS ON HEATING AND VENTILATING AND FORMULA ON SAME.

Edited by FRED J. POSTEL, Mech. Engr.

### HEATING.

It is safe to say that in the majority of cases where the installation of a heating system is under consideration, the architect or engineer has a reasonable doubt as to whether he should install a steam or hot water system. It may be well, therefore, to consider some of the advantages and disadvantages of the two systems. In this comparison the simple gravity heating system is the one referred to.

Generally speaking, the advantage of the steam over hot water is lower first cost, smaller radiators and smaller piping. The principal disadvantage is the fact that the temperature of the radiating surface cannot be regulated to meet the demands of the weather conditions. Again, the system is operative only so long as there is pressure in the mains. If the pressure is allowed to fall to atmosphere, circulation ceases, and the building is, to all intents and purposes, without a heating system, even though there is a smoldering fire in the furnace.

The advantage of the hot water heating system is that the temperature of the water may be varied with the demands of the service. With a properly designed system the water circulates at a very low temperature, so that a smoldering fire will produce sufficient circulation in mild weather. This feature makes it possible also to continue heating the building after the fires have been banked for the night.

The principal disadvantages of a hot water system are the greater first cost, larger radiators and piping, and the ever present possibility of damage to decorations and furnishings, as a result of a leak in the system.

Numerous attempts have been made with varied success to overcome the disadvantages of both systems, but so far as I have found, none of these solve the problem for all conditions.

To provide for temperature regulation in a steam system two general systems have been brought out. One depends on throttling down the steam and discharging only enough into the radiator to provide the heat required. The other depends on air binding a certain number of loops in the radiator and operating the remaining loops at full pressure. The latter, of course, can be used only where compressed air is available and is used in connection with an automatic system of temperature regulation.

To overcome the disadvantage of large, ungainly radiators and piping in hot water systems, various devices have been used to increase the temperature of the water under conditions of extreme demand. These systems depend on increasing the pressure on the water above atmosphere, and are what may be referred to as closed systems, either wholly or in part.

### STEAM HEATING.

In designing a system of steam heating, it should first be determined whether the conditions will be best met by a gravity, or a vacuum system.

In a gravity system, the mains and radiating surface are so laid out that all condensation returns to the boiler by gravity and no machinery is required to keep the system in operation. This system is necessarily operated at a pressure above atmosphere so that the pressure in the radiators is sufficient to expel the air from the system

A vacuum system may be either a "dry" or "wet" system. In the dry system a vacuum is maintained on air valves which are intended to handle air only. In a wet system the condensation and the entrained air are removed through the same pipe.

There are a number of modifications of these two systems, but broadly speaking, all steam systems may be classed either as "gravity" or as "vacuum" systems.

In determining whether the expense of a vacuum system is justified by the conditions, the advantages to be obtained by using it must be carefully considered. two things which make a vacuum system better than a gravity system are, first, circulation at a lower pressure; second, quick circulation when new radiation is turned on. The former is of particular importance in cases where the exhaust steam from engines is used to heat the building. efficiency of the engine is increased as the back pressure is decreased. Therefore, the use of a vacuum system may be the means of saving considerable coal. On the other hand, the installation of a vacuum system cannot be justified from the standpoint of economy in coal consumption, if the demand for exhaust steam is so heavy that live steam must be used to make up the deficiency, even with the engine running against a back pressure.

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A well laid out gravity system of ordinary size should circulate freely with one pound pressure under all ordinary conditions and with not to exceed two pounds pressure in extreme cold weather, when the demand for steam and therefore the velocity of the steam in the pipes reaches a maximum. A vacuum system should not require to exceed one-half pound pressure under any condition.

A gravity system may be either a "one-pipe" or a "two-pipe" system and either of these may be an "up-feed" or a "down-feed" system. Except in the case of very high buildings equally good results can be obtained with either up-feed or down-feed, but where the building is very high there is an advantage in having a down-feed system.

A vacuum system may be either up-feed or down-feed, but will always be a two-pipe or a three-pipe system. The wet vacuum system is always necessarily a two-pipe system. The dry vacuum system when used in connection with cast iron radiation is usually a two-pipe system, the vacuum pipe being a very small pipe with probably ¼-inch branches and a main seldom larger than one incb. Where the dry vacuum system is applied to a coil system of heating in which the steam and returns are separate, the vacuum pipe will be required in addition to the other two, thus making a three-pipe system.

Inasmuch as loss of heat from buildings is by radiation and conduction from walls and windows and by the air which must be replaced by new air for ventilation, heating formulae must necessarily involve the quantities, area of wall, area of glass and the cubical contents, the last being in connection with frequency of changes of air.

The loss of heat through walls of buildings depends on the construction and thickness and the materials used, and on the difference of temperature between outside and inside surfaces.

The amount of heat in British Thermal Units, passing through an 8-inch brick or stone wall per degree, difference of temperature in British Thermal Unit per square foot of area per hour, is approximately 1/3 British Thermal Unit, and through wood wall of the same thickness, approximately 1/20 British Thermal Unit per degree difference of temperature per hour, per square foot, and through 12-inch brick or stone wall with an air space approximately ½ British Thermal Unit per degree difference of temperature per hour, per square foot.

The amount of heat passing through glass per square foot per hour per degree difference of temperature between inner and outer surfaces in British Thermal Unit is approximately 1 British Thermal Unit for single thickness of glass and approximately 2/3 British Thermal Unit for double glass.

For ordinary temperatures and pressures 55 cubic feet of air would require 1 British Thermal Unit per degree rise of temperature.

The foregoing, together with the fact that heat emitted from radiating surfaces per square foot, per hour, per degree difference of temperature above that of surrounding air is 1.8 British Thermal Units when radiating surface is 150 degrees above temperature of surrounding air to 1.7 British Thermal Units, when radiating surface is 110 degrees above temperature of surrounding air furnish a basis for estimating the amount of radiating surface required.

There are a great number of heating formulae in use and it is seldom that the results figured by these various formulae will agree. The formulae are all empirical formulae and are based on average conditions. If the conditions of any particular case vary considerably from the average, it is quite likely that none of the formulae will give correct results. For example, if a room with excessive exposure or an unusually large amount of glass, or a very large volume and comparatively small amount of glass is figured by one of these formulae, the results are bound to be unsatisfactory.

Allowance must, therefore, always be made with any of the formulae for local conditions and for this reason the writer has always made it a practice to use a factor "C" in all formulae, this factor being dependent upon the local conditions.

A simple formula which is sometimes used, but which is rather crude and not entirely accurate, is as follows:

Heating surface  $= \frac{1}{2}$  of net glass area plus 1/20 of net wall area plus 1/200 of cubic contents.

Mr. Linn, in his article on this subject in Vol. XIV of the "Hand Book", gives several formulae for calculating the radiating surface, any one of which will be found quite satisfactory. The following is one of these, summarized and reduced to algebraic statement:

**W** = Gross exterior area less "G" in sq. ft. of exposed walls of the room, for which radiation is to be computed, including area of ceiling where room or space above is not heated.

**G** = Area in sq. ft, of exterior window and exterior door openings measuring the entire wall opening for window and door-frames of room to be heated.

 $\mathbf{V} = \text{Cubic foot contents of the room to}$  be heated.

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**L** = Factor for lowest recorded exterior temperature. Determine lowest recorded exterior temperature from weather bureau reports, then find "L" in table below corresponding. For Chicago this is —  $20^{\circ}$ , therefore L = 1.14, for Chicago.

Lowest recorded temp- erature for the locality.	L	Lowest recorded temp- erature for the locality.	L
— 45°	1.5	- 10	1.
- 40	1.43	+ 0°	. 93
— 35°	1.36	+ 5°	.86
— 30°	1-29	$+10^{\circ}$	. 79
- 25	1.21	+ 15	.71
— 20°	1.14	+ 20	. 64
— 15°	1.07	+25	.57

**Q** = Radiation required to heat the room to 70° Fah, under average conditions,

**C** = Factor for local and special conditions exposure, etc., fixed by the judgment of the estimator to cover conditions varying from the average.

 $\mathbf{T} = \text{Factor}$  for thickness of enclosing walls.

T = 10 for walls 8 to 10 inches thick.

T = 15 for walls 12 to 26 inches thick.

T = 20 for walls 26 to 38 inches thick.

**M** = Factor for method of heating. **M** = .0055 for steam heating.

M = .0072 for hot water in radiators 180°.

M = .0081 for hot water in radiators 170 .

M = .0092 for hot water in radiators 160%.

Note—If water is 175 degrees in flow and 145 degrees in return, the average is 160 degrees, and is the temperature which should be expected in radiators under these conditions.

Formulae for computing either steam or hot water radiation required in any room in any building in any location:

$$\left[ \left( \frac{W}{T} + G \right) 75 + V \right] M = Q_{\text{Required}}^{\text{Average}}$$

QC = Special radiation required.

Above formula is based upon using direct radiation and provides for one change per hour. For more frequent changes increase the cubic contents by as many times as it is desired to change the air per hour, the other factors remain the same.

"Direct" radiation is surrounded by warm air, but cold air comes in contact with the surface, in "Direct-indirect" and "Indirect" systems to a greater or less extent; so that for "Direct-indirect" radiation add 25 per cent and for "Indirect" radiation add 50 per cent.

Mr. Linn's article also contained a table of steam mains which may be applied with quite satisfactory results. The table is quoted herewith:

### SIZES OF STEAM MAINS.

	One Pipe	Two Pipe
Radiation	Work	Work
125 sq. ft	$1\frac{1}{2}$ in.	$1\frac{1}{4}\times 1$ in.
250 sq. ft	2 in.	$1\frac{1}{2} \times 1\frac{1}{4}$ in.
400 sq. ft	2 15 in.	$2 \times 1.1$ in.
650 sq. ft	3 in.	$2\frac{1}{2}\times 2$ in.
900 sq. ft	3½ in.	$3 \times 2\frac{1}{2}$ in.
1250 sq. ft	4 in.	$3\frac{1}{2} \times 3$ in.
1600 sq. ft	4 1/2 in.	$4 \times 3\frac{1}{2}$ in.
2050 sq. ft	5 in.	$4\frac{1}{2}\times4$ in.
2500 sq. ft	6 in.	$5 \times 4\frac{1}{2}$ in.
3600 sq. ft	7 in.	$6 \times 5$ in.
5000 sq. ft	8 in.	$7 \times 6$ in.
6500 sq. ft	9 in.	$8 \times 6$ in.
8100 sq. ft	10 in.	$9 \times 6$ in.

### HOT WATER HEATING.

In hot water heating the system may be a one-pipe or two-pipe system, or may be a gravity circulation system or a forced circulation system.

The gravity circulation system is dependent for circulation upon the fact that cold water is heavier than hot water, therefore, the pitch of supply line should be upward from the boiler (which is the reverse of the requirement in steam heating) and the return should pitch downward toward the boiler as is the case, also, in steam heating.

In forced circulation systems which must be used when long horizontal runs are encountered, as is the case in factory heating, where the boiler or source of heat is in a detached power plant, a pump must be employed.

In one-pipe systems the radiators are connected in shunt with the supply lines, that is, the water to a radiator is taken from supply line, passes through radiator and is returned to supply line at a point further along in the direction of the travel of the water. Special fittings are sometimes employed in the diversion of the water into the radiators, especially in the case of forced circulation systems.

Two-pipe systems, especially in gravity circulation systems, may be considered to have more positive circulation.

Either one-pipe or two-pipe, or gravity or forced circulation systems may be closed or open systems, though closed systems are rarely found except in larger forced circulation systems. In either system an expansion tank must be used because of the expansion of water as its temperature rises.

The formulae which are used in estimating the amount of radiating surface required for steam heating may be used for computing the amount of radiating surface required for hot water heating, providing a factor dependent upon the difference in temperature of the hot water and of the steam is introduced.

Mr. Linn in his article in last year's hand book gives a table of size of mains for direct and indirect radiation, which is here reprinted:

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	Direct	Indirect
Ra	diation	Radiation
Wi	ll Supply,	Will Supply
rea	Feet	Feet

Size	of Main	Area	Feet	Feet
$1\frac{1}{2}$	in	2.03	200	135
2	in	3.35	325	200
2 1/2	in	4.78	450	300
3	in	7.38	700	450
3 1/2	in	9.82	900	600
4	in	12.73	1200	800
4 1/2	in	15.93	1500	1000
5	in	19.99	2000	1200
6	in	28.88	3000	2000
7	in	38.73	4200	2800
8	in	50.03	5600	3600
9	in	63,63	7000	4600
10	in	78.83	8500	5600

In forced circulation systems it is considered good practice to so proportion mains and returns that velocity of water will not exceed 200 feet per minute.

Carpenter gives as a practical rule, applicable when main and supply do not exceed 200 feet in length, "The diameter of main supply or return pipe in a system of direct hot water heating should be one pipe-size greater than the square root of the number of square feet of radiating surface, divided by 9 for the first story, by 10 for the second story and by 11 for the third story of the building. For indirect hot water, multiply above by 1.5".

### BOILERS FOR HEATING SYSTEMS.

Boilers sold for heating installations are rated by manufacturers in square feet of radiating surface, which they will supply. Comparison of boilers sold by different manufacturers discloses the fact that boilers of different makes, having the same amount of heating surface have widely different ratings, as given by the manufacturers; the difference being in some cases nearly 100 per cent.

The capacity of a boiler depends on the form and extent of the heating surface, the water and steam space and upon the amount of grate surface.

A boiler horse power is arbitrarily defined as the evaporation of 34½ pounds of water per hour from a temperature of 212 degrees to steam at atmospheric pressure, which, as the evaporation of one pound of water under these conditions requires 965.7 British Thermal Units, is the equivalent of 33,316 British Thermal Units. As one square foot of direct steam radiating surface emits approximately 250 British Thermal Units per hour a boiler horse power should supply 133 square feet of radiating surface.

To allow for less efficient management of heating boilers than of power boilers, however, it may be considered good practice to limit the radiating surface which may be supplied by one boiler horse power to 100 square feet.

The heating surface required per boiler horse power in power boilers usually ranges from 7½ to 12 square feet, dependent upon the kind of boiler. For heating service, it seems safe to assume that the heating surface per boiler horse power, or per 100 square feet of radiation supplied should rarely be less than 15 square feet.

In power boilers the ratio of grate surface to heating surface usually ranges from 1 to 40, to 1 to 60. In boilers for heating service the ratio of grate surface to heating surface should not be less than 1 to 40 and preferably more.

The satisfactory operation of any boiler is dependent upon sufficient draft as well as upon other conditions. Sufficient draft is obtained by proper chimney proportions. The question of chimneys was discussed in Mr. Linn's article, which is here reprinted:

### CHIMNEYS.

Kent gives the following:

The commonly accepted theory of chimney draft based on Peclet's and Rankine's hypotheses (see Rankine, S. E.), is discussed by Prof. De Volson Wood in Trans. A. S. M. E., Vol. XI.

Peclet represented the law of draught by the formula

$$h=\frac{n^2}{2g}\left((1+G+\frac{H}{m}\right)$$

in which "h" is the "head," defined as such a height of hot gases as, if added to the column of gases in the chimney, would produce the same pressure at the furnace as a column of outside air, of the same area of base, and a height equal to that of the chimney:

"u" is the required velocity of gases in the chimney;

"G" a constant to represent the resistance to the passage of air through the coal;

"I" the length of the flues and chimney; "m" the mean hydraulic depth or the area of a cross-section divided by the perimeter;

"f" a constant depending upon the nature of the surfaces over which the gases pass, whether smooth, or sooty and rough.

Rankine's formula (Steam Engine, p. 288), derived by giving certain values to the constants (so-called) in Peclet's formula, is

$$h \! = \! \left[ \begin{array}{c} \frac{T_{\circ}}{T_{z}}(0.0807) \\ \frac{T_{\circ}}{T_{z}}(0.084) \end{array} \right] H \! = \! H \quad (0.96 \ \frac{T_{\circ}}{T_{z}} \! = \! 1) H$$

in which  $\Pi$  = the height of the chimney in feet;

 $T_{\rm o}=493$  F. absolute (temperature of melting ice);

 $\mathbf{T}_1 = \mathrm{absolute}$  temperature of the gases in the chimney.

 $T_{\rm g} \equiv {\rm absolute}$  temperature of the external air.

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#### SIZES FOR CHIMNEYS.

A very essential adjunct to the working of a plant is the chimney flue, and the form of the flue has much to do with its effectiveness; thus as gases ascend in a spiral motion a round flue is the best, and a square one is better than one of rectangular shape. If of brick it should be evenly plastered. The flue should extend below the smoke pipe connection only a short distance to permit the removal of soot; if continued far below it will form an air pocket and cause down currents

Sq. Feet			Sq. Feet
of Direct			of Direct
Steam	Horse	Size of	Water
Radiation	Power	Chimney	Radiation
250	2.5	8"x 8"x25'	400
500	5.0	8"x12"x30'	850
800	8.0	12"x12"x35'	1350
1400	14.0	12"x16"x40'	2400
2200	22.0	16"x16"x50'	3700
3500	35.0	18"x18"x60'	5900
5500	55.0	20"x20"x70'	9300
8000	80.0	24"x24"x80'	13000

#### AUTOMATIC HEAT REGULATION.

The principles of automatic heat regulation are very thoroughly discussed in Mr. Linn's article which is herewith reproduced:

Automatic heat regulation is now recognized as a very convenient item in the equipment of modern buildings.

Its application naturally depends upon the character of the heating apparatus, it being essential in all cases that each heated apartment be supplied with at least one of the temperature controlling instruments called "thermostats," this "thermostat" regulating automatically the sources of heat supply for the apartment in which it is placed.

If the system of heating be direct radiation, the control of the radiators is accomplished by means of pneumatic diaphragm valves taking the place of the ordinary hand valves, these pneumatic valves being connected with the "thermostat." If indirect heat is used, the passage of the warm air through the heat flues is usually controlled by "mixing dampers," so arranged as to automatically mix hot and cold air in the proper proportions before it reaches the apartment, these mixing dampers being under the control of the "thermostats."

The heat regulation systems of nized standing are generally operated by compressed air supplied by a suitable compressor in the basement, and distributed throughout the building by a system of galvanized iron and lead piping. The manufacturers of these systems invariably install the apparatus themselves, either as principal or sub-contractors, but in all cases executing to the owner a guarantee covering the operation and care of the system. The evidence seems to show that a saving of from 15 to 25 per cent in fuel consumption is accomplished in those buildings which are equipped with automatic heat regulation. This is a sufficiently large return upon the cost of the apparatus to justify its use in the majority of buildings, in residences, schools, etc., its use is imperative for hygienic reasons as well.

Specifications for temperature regulation should cover the system of piping to be installed minutely, as on the method of piping, and the size and kind of pipe used, depends, in a great measure, the success and durability of the system.

In connection with automatic control of temperature, there is also the control of the humidity of buildings, produced by artificial means. The question of humidity is a matter of great importance in buildings, and it is only since the invention of temperature regulation and the control of humidity that the device for producing humidity can be successfully installed.

(Refer to File 697, Tables of Miscellaneous Information in the back part of this book for tables)

#### VENTILATION.

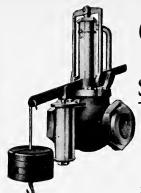
The term ventilation, when used in the ordinary sense is a purely relative term. Every room or building, unless it is hermetically sealed is "ventilated" to a certain extent. A room heated with steam or hot water direct radiation and with all the windows and doors closed is ventilated by the amount of air leakage, due to the fact that neither the doors nor windows nor even the walls are air tight and there is a constant tendency for the interchange of air from the outside to the inside of the building. With the indirect system of heating, fresh alr from the outside is introduced at a definite point and by means of a system entirely under control at all times.

The ducts supplying the air to the indirect radiation are usually provided with dampers, so that the amount of fresh air can be absolutely regulated. From the standpoint of ventilation, indirect radiation is far superior to direct radiation, but on account of the very much greater cost of operation, the amount of indirect radiation is usually restricted to one or two stacks in the ordinary residence.

The fan system of heating and ventilating is desirable from the ventilating standpoint to just the extent that fresh air is drawn from the outside. It should be understood that it is possible to operate a fan system, drawing the entire supply from the inside of the building. In this case, even though there is a movement of air, the ventilation is no better than with the ordinary direct radiation system. On the other hand, if all the air is taken from the outside, this system will provide the very best of ventila-In actual practice, for purposes of tion. economy, fan systems are usually operated to take most of the air from the outside, but a by-pass is provided, so that in extreme cold weather part of the air can be drawn from the inside of the building.

Quite frequently a combination of a direct heating system and a fan ventilation system is used. In such cases the heating system is usually designed to provide sufficient temperature under all weather conditions. The fan ventilating system is designed to supply sufficient air to maintain a pre-determined standard of purity and is then provided with just sufficient radiation to heat this air to the room temperature. In other words, the direct radiation is depended upon to furnish the ventilation only.

In laying out any system of ventilation it is necessary to decide first of all on the standard of purity to be maintained. Pure country air contains about four parts of Co2 in 10.000. This amount of CO2 can be increased to 6, 8 and even 10 parts without any bad results to the occupants of the room. Naturally there is no sharp, well defined line above which ventilation is totally



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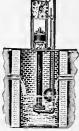


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bad or below which the ventilation may be referred to as absolutely good. As a general proposition, it may be said, however, that a system of ventilation which permits the CO2 to rise above 12 parts in 10,000 is not a good modern ventilating system, while on the other hand, for commercial reasons, it is seldom that an attempt to keep the air purer than 6 parts of CO2 in 10,000 is made.

In calculating the probable impurities, it may be assumed that the ordinary person in average good health, exhales 0.6 of a cubic foot of CO2 per hour and a "5-foot" gas burner vitiates about five times as much air as the ordinary person. A gas grate or any open fire-place, on the other hand, has a tendency to improve the ventilation; for while it uses up oxygen, it must be kept in mind that all the gases which pass up the chimney, must in the natural course of events be replaced by fresh air through the doors and windows.

As incandescent electric lights use up no oxygen, they have no effect on the ventilation of a room. In hospitals the amount of fresh air required for occupants is naturally much greater than in buildings occupied by persons in good health. The amount of fresh air per occupant must be doubled and some times trebled to maintain the required

standard of purity,

In laying out a fan system of ventilation, great care must be taken to avoid drafts. Where air is introduced at or near the ceiling, a register velocity of 600 feet per minute is permissible, but where air is introduced at or near the floor line, the velocity must not exceed 200 feet per minute as a maximum, and in many cases where the best results are desired, the velocity is kept down to about 125 feet per minute. The velocity through the register of a vent flue may be very much greater than through a fresh air register. Except where the register is so located as to directly expose the occupants of the room to a draft, it is not unusual to permit a register velocity of 600 feet per minute.

In no case are register velocities over 600 feet per minute desirable because even though the register may be so located that there may be no trouble from draft, there will be a distinct "humming" noise which is

disagreeable.

## TABLE OF EQUIVALENT TEMPERATURE FOR TESTING A HEATING PLANT AT DIFFERENT OUTSIDE TEMPERATURES.

For the purpose of indicating the efficiency of the apparatus for any specified condition, Prof. Carpenter gives the following table, which has been generally accepted as the standard test.

For steam, the radiator temperature in all cases is assumed to be that due to a pressure of 3 pounds at the boiler, or about 220°

Fahr.

For water, the radiator temperature is assumed in all cases to be at an average of 160° Fahr.

For a plant proportioned sufficiently to maintain a temperature of  $70^{\circ}$  when the outside temperature is at zero.

Temperature of	Room should be
Outside Air	raised to
10	64.7
0	70.0
10	75.1
20	\$1.0
30	86.5

4.0	93.1
50	98.7
60	104.7
7.0	110.5
8.0	117.1
9.0	123.5
100	130.3

See University of Illinois Engineering Experiment Station Bulletin No. 31 for methods and results of tests on house heating apparatus. These tests have been made on different kinds of house heating apparatus with different kinds of fuel. The bulletin embodies the results of about three hundred tests. These bulletins are for free distribution.

#### EXPANSION AND CONTRACTION.

Scarcely anything can withstand the expansion of iron. It expands from 23° to 212. about 1 800 of its length, which in 100 fect equals 13, inches. The expanding power of a 2-inch pipe when heated to a temperature of 100 pounds steam, or to 33%, exerts a force sufficient to move 25 tons.

Cast iron expands 1 162000 of its length for each degree Fahr, it is subjected to within ordinary limits while in its solid

state.

Wrought iron expands 1 150000 of its length for each degree Fahr. To find the expansion of a line of pipe, multiply its length in inches by the number of degrees of temperature applied and divide the product by 150,000 for required expansion in inches; thus 100' × 12" = 1200 × 338 = 405600 ÷ 150000 = 2.7 inches.

Special attention, then, must be given to the expansion and contraction of pipes and allowance made for it. Pipes and branches must be unconfined, especially in the direction of their length.

Expansion joints should not be used if the expansion can be compensated for in any other way.

#### RADIATION OF HEAT.

Radiation of heat takes place between bodies at all distances apart, and follows the laws for the radiation of light.

The heat rays proceed in straight lines, and the intensity of the rays radiated from any one source varies inversely as the square of their distance from the source.

This statement has been erroneously interpreted by some writers, who have assumed from it that a boiler placed two feet above a fire would receive by radiation only one-fourth as much heat as if it were only one foot above. In the case of boiler furnaces the side walls reflect those rays that are received at an angle—following the law of optics, that the angle of incidence is equal to the angle of reflection,—with the result that the intensity of heat two feet above the fire is practically the same as at one foot above, instead of only one-fourth as much.

The rate at which a hotter body radiates heat, and a colder body absorbs heat, depends upon the state of the surfaces of the bodies as well as on their temperatures. The rate of radiation and of absorption are increased by darkness and roughness of the surfaces of the bodies, and diminished by smoothness and polish. For this reason the covering of steam pipes and boilers should be smooth and of a light color; uncovered pipes and steam-cylinder covers should be polished.

The quantity of heat radiated by a body is also a measure of its heat-absorbing pow-

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er, under the same circumstances. When a polished body is struck by a ray of heat, it absorbs part of the heat and reflects the rest. The reflecting power of a body is therefore the complement of its absorbing power, which latter is the same as its radi-

ating power.

The relative radiating and reflecting power of different bodies has been determined by experiment, but as far as quantities of heat are concerned, says Prof. Trowbridge (Johnson's Cyclopaedia, art. Heat), it is doubtful whether anything further than the said relative determinations can, in the present state of our knowledge, be depended upon, the actual or absolute quantities for different temperatures being still uncertain. The authorities do not even agree on the relative radiating powers.

#### HEATING BY ELECTRICITY.

If the electric currents are generated by a dynamo driven by a steam engine, electric heating will prove very expensive, since the steam engine wastes in the exhaust steam and by radiation about 90 per cent of the heat units supplied to it. In direct steam heating, with a good boiler and properly covered supply pipes, we can utilize about 60 per cent of the total heat value of the fuel. One pound of coal, with a heating value of 13,000 heat units, would supply to the radiators about  $13,000 \times .60 = 7800$  heat units. In electric heating, suppose we have a first class condensing engine developing 1 H. P. for every 2 lbs. of coal burned per hour. This would be equivalent to 1,980,000 ft. lbs.  $\div$  778 = 2545 heat units, or 1272 heat units for 1 lb. of coal. The friction of the engine and of the dynamo and the loss by electric leakage, and by heat radiation from the conducting wires, might reduce the heat units delivered as electric current to the electric radiator, and these converted into heat to 50 per cent of this, or only 636 heat units, or less than one-twelfth of that delivered to the steam radiators in direct steam

Electric heating, therefore, will heating. prove uneconomical unless the electric current is derived from water or wind power, which would otherwise be wasted.

#### STEAM BOILER AND PIPE COVERINGS.

Experiments under actual steam plant conditions, conducted by Geo. M. Brill (Trans. Am. Soc. Eng. Vel. XVI) show that in ordinary practice the early results and theories, advanced by Sir Isaac Newton and Peclet, are too low. He found that by using an 8 inch bare steam pipe 60 feet long with an average pressure of 110.5 lbs, by gauge, and with air 75.5 degrees Fahrenheit, that 736.546 B. T. U. per square foot of surface per hour, were lost. These results accord so closely with the experiments conducted by Prof. R. C. Carpenter of Cornell University, and Prof. M. E. Cooley of the University of Michigan, that it seems fair to use these results as a premise of calculation in practical work. The magnitude of the loss from a bare pipe can be understood possibly more closely by the following calculation:

Adopt from Mr. Brill's results a loss of 736.546 B. T. U. per square foot of surface per hour and, assuming an 8-inch pipe to be 100 feet long, the loss would then be

as follows:

736.546 B. T. U. multiplied by 225 square feet (surface of an 8-inch pipe 100 feet long) equals 165722 B. T. U. lost per hour or, divided by 30,000 B. T. U., heat units in one horse-power at above pressure (assuming 341/2 lbs. of water from and at 212 degrees to be a horse-power) equals 5.5 horsepower per hour lost. The method adopted for preventing in a measure this loss is by the application of some non-conducting material to the radiant body, having for its object the protection of the external surfaces from loss of heat and from any injurious action liable to occur in consequence of their exposure. It will therefore be seen that a great economy is effected by the application of pipe covering or boiler lagging.

#### LIST OF RESOLUTIONS PASSED BY THE CHICAGO VENTILATION COMMITTEE. 1911-1912.

Report by Meyer J. Sturm, Member of this Commission as delegated by the Chicago Architects' Business Association.

1. Resolved, that carbon dioxide in the amount present in ordinary expired air does not settle out from a mixture of air and carbon dioxide,

Resolved, that carbon dioxide. countered in working practice is not the harmful agent of major importance in ex-

pired air or air otherwise contaminated.
3. Resolved, that a temperature of 68 degrees F, with a proper relative humidity is the proper maximum temperature for liv-

ing rooms artificially heated.

4. Resolved, that in the present state of knowledge, it is impossible to designate the particular harmful factor in or associated with expired air.

5. Resolved, that it is cheaper to ven-tilate by currents than by dilution. 6. Resolved, that the principle of ventila-

6. Resolved, that the principle of ventilation by currents is preferable to the principle of ventilation by dilution.
7. Resolved, that for adequate ventilation, smaller volumes of air suffice when introduced by currents than when introduced by dilution.

Resolved, that ventilation which utilizes the principle of convection in producing currents is more effective and econo than that which neglects such principle.

Resolved, that upward ventilating currents in crowded rooms are desirable pro-

vided the sources are free from dust.

10. Resolved, that in making use of upward ventilation, attention should be given to the counteracting of wall chill and window chill.

11. Resolved, that for removal of kitchen odors, body odors, stable odors and other odors associated with heat production, upward ventilation is more efficient than down-

ward ventilation is more eincient than downward ventilation.

12. Resolved, that in these processes of manufacture where considerable CO<sub>o</sub> is liberated, the CO<sub>o</sub> content is not a proper index of air pollution.

13. Resolved, that the delivery of a certain volume of air per hour, per occupant, into a given space, does not necessarily constitute requilition. ventilation.

14. Resolved, that it is necessary to warm air for ventilation when the outside temperature is below 50 degrees F.

Resolved, that air, which is intro-15. duced into an occupied room in such a way as that it strikes the occupant, should not be lower in temperature than 60 degrees F.

16. Resolved, that heating and ventilating are separate questions and should always be so considered. When efforts are made to amalgamate them, it should be borne in mind that there are parts of them that can-

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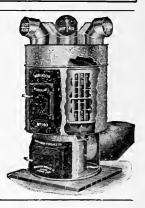
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not be amalgamated and must be kept separate.

17. Resolved, that from the standpoint of health relative humidity is one of the most

important factors in ventilation.

18. Resolved, that air washing devices should be installed in duplicate when used when used in places such as hospitals, etc., that require artificial ventilation. continuous

STREET CARS:

Resolved, that ventilation by the deck in street sash alone is never satisfactory

20. Resolved, that the plenum principle of ventilation is not applicable to the ventilation of street some

tilation of street cars.

21. Resolved, that ventilation in street cars should always be accomplished by means of air delivered low down, passing or ar through the heaters by means of ets hooded to the heaters, and flowing the car below the seat level, the foul leaving through the ceiling by suitable

Resolved, that inlet ducts should be short and as free from angles as possible.

23. Resolved, that inlets should distributed, and of such size the size that drafts are not perceptible when the air enters at a temperature of from 50 to 60 degrees F., and they should be sufficiently numerous to the maximum number of occupants supply with the proper amount of air.

24. Resolved, that in the ventilation of street cars the sum total intake area should be at least as great as the sum total out-let area; that a large excess of exhaust area over inlet area results in loss of efficiency by reason of excessive air leakage, some of which does not pass through the heaters or the breathing zone.

25. Resolved, that air delivered into street cars should not be colder than 50

F degrees

26. Resolved, that in street cars, or other cars in which wraps are worn, a temperature of not less than 50 degrees F., or more than 60 degrees F. should be maintained during artificial heating. ELEVATED CARS:

Resolved, that ventilation by the deck sash alone is never satisfactory in elevated cars.

28. Resolved, that either the plenum or vacuum principle of ventilation is applic-able to the ventilation of cars on elevated

railways.

ranways.

29. Resolved, that ventilation in elevated cars should always be accomplished by means of air delivered low down, passing means of means of air delivered low down passans over or through the heaters by means of inlets hooded to the heaters, and flowing in-to the ear below the seat level, the foul air leaving through the ceiling by suitable air outlets.

Resolved, that inlet ducts should be on, resolved, that there ducts should be short and as free from angles as possible.

31. Resolved, that inlets should be evenly distributed, and of such size that drafts are not perceptible when the air enters at a temperature of from 50 to 60 degrees F. and they should be sufficiently numerous to the maximum number of occupants

supply

with the proper amount of air.

32. Resolved, that in the ventilation of elevated cars by exhaust systems the sum total intake area should be at least as great as the sum total outlet area; that a large excess of exhaust area over inlet area results in loss of efficiency by reason of excessive air leakage, some of which does not pass through the heaters or the breathing zone.

Resolved, that for elevated cars the floor inlet hooded to the heater is 33 simple

preferable.

31. Resolved, that air delivered into elevated cars should not be colder than 50 de-

grees F.

grees r. 25. Resolved, that in elevated cars, or other cars in which wraps are worn, a temperature of not less than 50 degrees F. or more than 60 degrees F. should be maintained during artificial heating.

PROPOSED: Railroad Cars-Day Coaches, Sleeping Cars, Suburban Cars and other cars making long runs.

36. Resolved, that ventilation by the deck sash alone is never satisfactory in railroad cars.

that either the plenum vacuum principle of ventilation is applicable to the ventilation of railroad cars.

as, Resolved, that ventilation in railroad cars, as Resolved, that ventilation in railroad cars should always be accomplished by means of air delivered low down, passing into a heating chamber, or through inlets hooded to the heaters, and flowing into the car below the seat level, the foul air leaving through the ceiling by suitable outlets.

39. Resolved, that inlet ducts should be short and as free from angles as possible short and as free from angles as possible.

4.0 Resolved, that inlets should be evenly distributed, and of such size that drafts are not perceptible when the air enters at a t⊷mperature of from 50 to 60 degrees F., and they should be sufficiently numerous to the maximum number of occupants supply

with the proper amount of air.

41. Resolved, that in the ventilation of railroad cars by exhaust systems the sum total intake area should be at least as great as the sum total outlet area; that a large excess of exhaust area over inlet area results in loss of efficiency by reason of excessive air leakage, some of which does not pass through the heaters or the breathzone.

42. Resolved, that air delivered into railroad cars should not be colder than 50 degrees F.

43. Resolved, that in day coaches, sleeping cars, suburban and other cars in which long runs are made, the temperature should not fall below 60 degrees F. or rise above 70 degrees F. during artificial heating. GENERAL:

44. Resolved, that in car ventilation the use of a plenum system without outlets, or of an exhaust system without inlets, is not compatible with a high degree of efficiency. STANDARDS:

45. Resolved, that the following standards should apply to the ventilation of ears

upward draft:

Street cars, elevated cars, or other cars making frequent stops, during which the doors are opened, shall be so ventilated that the amount of air entering the car for ventilation, through openings provided for such purpose, shall be at the rate of not less purpose, shall be at the rate of not less than five hundred (500) cubic fet per hour, per occupant, based upon the maximum carrving capacity (seats and standing room included) of such car.

Day coaches, sleeping cars, suburban cars, and other cars making long runs, and also cars in which smoking is permitted, shall be so ventilated that the amount of air enter-ing the car for ventilation, through openings provided for such purpose, shall be at the rate of rot less than one thousand (1,000) cubic feet per hour, per occupant. based upon the maximum seating capacity of

such car. 46. Resolved, that the carbon dioxide content of the air of cars should not exceed ten parts by volume in each ten thousand (10,000) parts of air; provided, that in street cars, elevated cars and other cars used in local intra-urban service the carbon dioxide content may not rise above twelve parts by volume in each ten thousand (10,000) parts

of air.

The work of the Chicago Ventilation Committee is by no means complete, the two years of study on the subject having, how-ever, resulted in the adoption of resolutions covering the subject of ventilation. The method of arriving at these resolutions and method of arriving at these resources, the experiments conducted have been quite exhaustive in their scope. Through the coexhaustive in their scope. Through the co-operation of the Chicago Board of Educa-tion and the City Health Department it has been made possible to set up complete ex-perimental stations under actual working conditions and it is from the experiments and observations under these practical conditions that these resolutions have been adopted.

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#### POINTS ON VARNISH.

BY HERMAN ROSENBERG

Drying and Hardening.—Proper light and ventilation are absolutely necessary to facilitate drying and hardening. Varnish applied in buildings that are damp and not properly heated in cold weather, will be considerably retarded in drying and hardening. Extremely hot weather will also keep varnish soft-for quite a time. The best results are obtained at a temperature of 70 to 75 degrees Fahrenheit.

Turning White.—It is caused by the action of water and dampness. The more elastic the varnish, the better it will resist this action, whereas, cheap, brittle, quick-drying varnishes are very easily affected.

Brittleness.—Is an inherent defect in the varnish caused by an excess of dryer, lack of oil, or by adulterated materials having been used in its manufacture. If a varnish powders white under friction of the finger or easily scratches white, that is incontrovertible evidence of its poor quality. Brittle varnishes should not be used even for the undercoats, as they destroy the toughness and durability of the finish, despite its being protected with an elastic, durable finishing varnish. It is poor economy, in any event, to use brittle varnishes, as the cost of application, which is the main expense, is the same as if good material were employed.

Chilling.—As its name implies, is caused by exposure to cold weather. Varnish should never be used while in this condition. To remedy is to keep the chilled varnish in a warm room, until it has been restored to its normal condition. Long exposure to cold weather may also cause the varnish to become "specky" and "seedy." in which event it is necessary to keep it near a steam pipe or warm stove for some time, until the chilled particles have disappeared.

**Cracking.**—Cracking is caused by the under coats not having been dry when the finishing coat was applied, or when abnormally heavy coats have been used, especially for the undercoats. Brittle varnishes are liable to crack when exposed to sudden changes of temperature.

Blooming or Going Foggy.—Is caused by exposure to dampness, moisture or gases, after the varnish has become hard. The more elastic the varnish, the less liable it is to "bloom" or become "foggy."

Wrinkling, Crawling, Cramping or Sagging.—Is caused by applying the varnish too heavily or by exposure to sudden changes of temperature while in the process of drying, or if the undercoats are not dry when the finishing coat is applied.

Deadening or Sinking Away.—Caused by the undercoats not having been allowed sufficient time to dry, causing the finishing coat to become absorbed while in the course of hardening. Insufficient foundation coats will also cause the finishing to sink away.

Blistering.—Is caused by the action of heat, especially from the concentrated rays of the sun, if sap or dampness is retained in the wood, or if moisture exists in the undercoats when the finishing coat is applied.

Pitting.—Is caused by applying varnish over an oily or damp surface; also, if the varnisher is not careful to thoroughly incorporate the turpentine in reducing the varnish, or uses improper thinning material.

Knots and Sappy Woods.—The sap and knots should be "killed" by the use of grain or wood alcohol shellac for the first coat. If this is not done, the sap will work through and injure the finish.

Thinning.—When found necessary, should be done with spirits of turpentine. In order to insure proper amalgamation, neither the varnish nor the turpentine should be too cold when mixing. The warmer the varnish and turpentine, the quicker the amalgamation. After reducing the varnish, allow it to stand awhile before using. Oil, Japan or liquid dryer should never be added to varnish.

SWEATING.—Is caused by rubbing the undercoat before it is thoroughly dry.

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#### REPORT OF FIRST INSPECTION OF THE TENNESSEE TEST FENCE.

BY HENRY A. GARDNER.

ASSISTANT DIRECTOR INSTITUTE OF INDUSTRIAL RESEARCH, WASHINGTON, D. C.

In order to broaden the investigations which have been carried on in different parts of the country to determine the durability of various kinds of paint, a series of painted panels were erected on State Fair Grounds at Nashville. Tenn., on September 15, 1910, by the Scientific Section of the Educational Bureau of the Paint Manufacturers' Association of the United States

The panels placed upon the fence were 40 inches high, 30 inches wide, and 1 inch thick, being made of the best grade of white pine boards, tongued, grooved, and leaded together and protected on edges with weather strips. These panels were placed upon a fence frame nearly 150 feet long, running north and south. thus affording the panels an eastern and western exposure.

A series of white paints were used for the test, having been specially prepared for the work from specifications. Paints tinted with ochre, chrome yellow, lampblack or other tinting materials have shown in other field tests the value of these pigments in giving to white paints increased wearing values. These coloring materials were therefore omitted in the paints made for the Nashville fence, as the object of the tests was to determine the relative durability of various white pigments. When the results of these tests have warranted conclusions on this point, those white-paint bases which have proved most durable may, of course, be tinted with various colors, if desired, and still greater service be expected from their use.

The paints were all carefully applied

to the panels in three-coat work, the application being under the constant supervision of prominent master painters and a committee representing the Scientific Section of the Educational Bureau and other technical organizations. The same careful record of conditions, reductions, spreading rates, etc., that was followed in previous tests was also observed in the application of the paints to the Nashville Panels.

Formulas on Southern Test Fence, Formulas No. 1 to No. 37 were all ground in pure linseed oil. They were made in the form of semi-paste and then thinned down with sufficient pure linseed oil so that each would have a relative viscosity. To each formula was then added a sufficient amount of pure lead and manganese linoleate drier to give proper drying qualities. On thinning for the priming coat, one pint of turpentine was added to each gallon of paint. For the second coat, one-half pint turpentine and one-half pint pure linseed oil were added to each gallon. For third-coat work, reduction was made with one pint of pure linseed oil. In the case of Formulas 32 to 36, reductions were the same, except that a series of specially prepared wood turpentines were used in place of the pure gum spirits used in Formulas 1 to 31. Formulas 38 to 41, as will be shown, were ground in equal parts of the oils test-These formulas, however, were all thinned for application with pure gum spirits of turpentine, and the respective vehicle in which they were ground.

The various grades of wood turpentine which were used in Formulas 32 to 36 were

TENNESSEE TEST FENCE COMMITTEE. Mr. J. W. Sample, Assistant to Mr. Lucius P. Brown, State Dairy and Food Commissioner, Nashville, Tenn.

Mr. S. J. Underwood, Member Executive Board,

International Association Master House Painters and Decorators of the United States and Canada, Nash-

wille, Tenn.

Mr. Henry Λ. Gardner, Assistant Director, The Institute of Industrial Research, Washington, D. C.

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supplied for the tests by the U. S. Forest Products Laboratory at Madison, Wis. These were made from pine stumps and sawdust, and, of course, varied greatly in their composition. A full report covering this point will be issued by the Forest Products Laboratory in the near future.

Inspection. The first official inspection of the Nashville tests was made on Wednesday, February 21, 1912, over seventeen months after the panels were exposed. Each panel was carefully examined for the usual signs of wear, such as chalking, checking, surface decay, etc., a high-power magnifying glass being used and other methods followed as usually employed for the inspection of painted surfaces.\*

Cut No. 1. View of panel painted with 100% Basic Carbonate-White Lead.

The following paragraphs describe the most striking results of the tests and present the conclusions to be reached so far.

Condition at Panel Joints. Considerable warping of the boards at the tongue-and-groove joints was noticed, and this condition caused unsightly appearances on several panels, near the grooves. The inspection therefore was confined largely to those areas between the grooves, although a record has been made in the detailed report of each paint that has been affected by this condition.

Single-Pigment Paints. Of the four single-pigment paints upon the fence, the basic carbonate-white lead was the darkest and most deeply checked. Basic sulphate-white lead was in much better condition and presented a smooth even surface that



Cut No. 2 View of panel painted with 100° Basic Sulphate-White Lead,

<sup>\*</sup>See "Paint Technology and Tests," by Henry A. Gardner, McGraw-Hill Book Co., New York, 1911.



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100 WILLIAM STREET, NEW YORK Philadelphia was quite white. Excessive chalking of this pigment indicated that a percentage of zinc oxide would have been of material benefit to it.

Zinc oxide, a pigment which in other tests has not given good service when used alone, is in very fair condition on the Nashville test fence. Although slightly transparent, its ultra-white surface stands forth in contrast to the darkened condition of many of the other panels upon the fence. It is showing considerable fine matt checking which later may develop into cracking. The use of this pigment, however, in goodly percentage with a lead pigment seems highly advisable.

Zinc lead gave good results from a protective standpoint, presenting a surface that was quite free from defects except for considerable darkening. Leaded zinc was not used as a straight pigment, but in Test No. 5 was applied in combination with basic-carbonate-white lead. In such combination it gave good results from the protective standpoint, but its surface was even darker than zinc lead.

Value of Zinc in Preventing Darkening of Paint. The industrial activity of Nashville and its importance as a railroad centre is probably the cause of the presence in the atmosphere of that city of considerable quantities of carbon particles and sulphur smoke. In order to keep a light-colored paint from darkening it seems advisable to have present in combination with the lead base, a considerable percentage of pigment that will give the paint hardness and resistance to gases. Zinc Oxide seems to be the pigment best suited for this purpose.

Oil Tests. Panel 41, which has been painted with pigment Formula 31 ground in a mixture of 50 per cent linseed oil and 50 per cent rosin oil, showed soon after its exposure a very yellow surface. During six months' wear this surface had bleached out in the sun to great whiteness, and considerable checking and chalking was apparent. At the end of a year rapid decay, accompanied by a return to the original yellowish tint of the paint, was evident. From this time on to the inspection, five

months later, scaling and general disintegration proceeded with great rapidity, leaving but little evidence of the smooth, glossy film that once covered the wood.

Panel 38, which was painted with pigment Formula 31 ground in equal parts of linseed oil and soya-bean oil, was still in very fair condition. It showed, however, considerable fine checking and a slightly darker surface than Panel 31. In other respects it was in very fair condition, Formulas for Panels 39 and 40, which respectively were ground in mixtures of 50 per cent corn oil and cottonseed oil admixed with 50 per cent of linseed oil, and with pigment Formula No. 31 as a base. were also in very fair condition, although they evidenced by their dusty surfaces the fact that their drying after application was very slow. Neither one of these oils can be recommended at this time. Experiments, however, are being made by Sub-Committee C of Committee D-1 of the American Society for Testing Materials, with the object in view of treating these oils so that their drying ability will be accelerated without detracting from their durability.

The panels which were painted with pigment Formula 31 ground in pure linseed oil and reduced with various wood turpentines and high-boiling-point petroleum spirits as thinners, indicated that the highest types of these materials were well suited to replace pure gum spirits of turpentine as a thinner for paints to be exposed out-of-doors.

Repainting tests of the various panels will probably be made next year, after the panels have been exposed for three years.

General Conclusions. As a result of these tests, it has been indicated that in the Southern Plateau, of which Nashville is the centre, white paints made wholly of corroded white lead are not suited for long exposure. When mixed with zinc oxide the white lead pigments form paints which are very durable and permanent in nature. Mixed lead and zinc paints containing a moderate percentage of the inert pigments are also much superior to the single-pigment paints.

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#### INAUGURAL ADDRESS OF ARGYLE E. ROBINSON

PRESIDENT OF THE CHICAGO ARCHITECTS' BUSINESS ASSOCIATION.

When a man recovers from the surprise of finding himself suddenly at the head of an association such as the Chicago Architects' Business Association, he begins to realize that he has been placed in that position for some purpose and he immeditude. begins to analyse the situation. I found this analysis very interesting, ately and I believe that this organization could not start the year in a better manner than to join me in a review of the conditions which we, as architects, are facing.

Not long ago, I met one of our prominent

Not long ago, I met one of our prominent members on the street, and he was greatly discouraged over the conditions, which exist in the practice of our profession, when several architects are endeavoring to land the same job. He told me that he had been treated disgracefully by competing architreated disgracefully by com tects and that he had about concluded to withdraw from all architectural associations and become a "free lance" so that he could indulge in any kind of practice that he saw fit to use, without feeling that as a member of this organization he was ostensibly up-holding the high principles of practice ad-vocated by this association, when in reality, owing to the tricky methods of competing architects, the high principles which he advocated were not appreciated by the owner and therefore were not effective in landing and therefore were not effective in landing jobs, and he felt that he would have to other methods.

informed him at that time that his logic was entirely wrong; that we, as architects, are only indulging in the struggle which has always existed between what might be termed civilization and barbarism, and that there were only two things for him to do, namely: to count himself among the producers or the up-builders, or those who are ducers of the up-bullets, of those who are struggling in the face of discouragement to better the conditions with which they find themselves surrounded; or to join the ranks of the unforceful, who merely drift with the tide and whose methods are tend-ing to destroy our profession, or in short, he must determine whether to be a good

the must determine whether to be a good citizen or a bad one.

We find similar conditions existing in all branches of commerce and extending to all branches of our government. Witness the corruption in our politics, and our public force, and then consider that in spite of all these destructive conditions that the world is constantly advancing and condi-tions in all walks of life are becoming better. the credit for which can only be given to those who have struggled to improve exist-

ing conditions.

There can be no stronger argument in favor of an organization such as the Chicago Architects' Business Association than the realization that some of our members do become discouraged in well-doing, for it proves that there must be something strongthe force which is tending to destroy our profession, and this stronger force can best be obtained through an organization such as our Business Association, backed as it is by the best efforts of each of you, and having the element of selfishness practistand for any action by this association that did not have as its prime object the

betterment of conditions for us all?

We do not all get discouraged at the same time, and in this lies our strength. I have often wondered what it was that has brought and held us together for so many years. It does not seem to me that it is entirely due to the social intercourse which we obtain. I am inclined to think the attraction comes from a deeper source than this and that after we have all struggled for a month with our nerve-racking duties, wherein we have perhaps endeavored to give our exacting clients something for nothing, which many of them seem to wish, and which some of us are foolish enough to try to deliver, we find that we are glad to come to these meetings and rub ellows with our brother architects and swap tales or prosperity and listen to plans for attaining more ideal conditions in the practice and development of our profession.

There is no profession entitled to greater

respect from everybody than that which we practice, for no one, unless he lives in the wilderness, comes without our influence, and we surely write the history, in our structhe degree of civilization existing tures, of in our time, and we exert a tremendous in-fluence for good in the development of our cities If the masses understood the great commercial value that beautiful architecture has in attracting visitors to their cities, they would do all in their power to develop best in their architects instead of endeavor-ing to draw out the worst, which would sometimes seem to be their object when they sometimes seem to be then object with the have business dealings with us, which conditions are usually the result of their lack lack of familiarity with building transactions. We should therefore never lose an opportunity to educate our clients and those in our community along matters in this line,

While we sometimes think we have diffiwhere we sometimes think we have diffi-culties to overcome in the handling of our clients, we ought to be thankful that they do not come to us, as in most other pro-fessions, when they are disgruntled or in poor health or in trouble. We are surely fortunate in that they seek us out because they are prosperous and wish to extend their business through the erection of new buildings or increase their happiness through

the erection of new homes.

We see on all sides of us firms of architects who fail to recognize the higher ethics of our profession and are conducting their business in such a way that they must be considered not only a detriment to the profession, but to the community, and this because of the community and the best of the community. cause they fail in their duties as educators of those with whom they come in contact, being satisfied to cater to the minds of those unskilled in building and to allow those unskilled minds to dictate, unquestioned, as to the design and construction of the proposed building. Such architects fill our cities with undesirable buildings and cause they fail in their duties as educators cities with undesirable buildings and promote scalawaggery through their promote scatawaggery unough their noisery drawn contracts, poorly prepared plans and unsupervised buildings erected in the cheapest way and for the cheapest compensation for the architect. No respect for their profession exists among these men—their sole idea is that architecture is a mere medium which dollars can be extracted from the public. the public. See how this state of affairs has demoralized apartment house building for the public. See how this state of affairs has demoralized apartment house building for the architect, and filled our cities with duplicate, cheaply designed and cheaply constructed buildings which look as though they had been sold by the yard.

If these conditions should be encouraged.

why should we pose as architects? Why not merely draughtsmen and implicitly obey hout study the dictates of those who without study the dictates wish our services? The bu wish our services? The building public is not very discriminating and often places the architect of high ideals in competition with those of low ideals, which is manifestly unjust and very discouraging to the architect who stands for something in his profession.

I would see this Association extend its influence by reaching out and taking in as members all architects, regardless of whether their practice is high-minded or low-minded and I would then endeavor to convince all of them that this organization has a purpose in its existence, and that the uplift is try to convince every architect that the State has endeavored to protect itself against unfit architects, and has wisely or unwisely

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placed its stamp of approval upon those now practising, just as the Government places its stamp upon the group and the Covernment its stamp upon its money, and the State expects the architect so approved to circulate

pects the architect so approved to circulate among the public and produce results that are of benefit to the community at large. The conditions under which we practice are of such a nature that they should develop in us the highest type of manhood, and should therefore equip us to take a leading position in most matters pertaining to the buildirg industries in our community. building industries in our community. to the This cannot be doubted when one considers This cannot be doubted when one considers the years of study necessary before an architect worthy of the name should open his office and start professional practice, including as it does a special knowledge of design and construction and intimate relations with the owner, the Building Department and all branches of the building industry, from the humble sewer digger to the master mechanic and the capitalist, and involving an intelligent insight into various involving an intelligent insight into various arts and crafts and also requiring as it does the development of the judicial mind does the development of the judicial mind on the part of the architect through the necessity of his serving as judge or arbi-trator in the settlement of disputes be-tween the owner and his various contractors and sub-contractors. Where can you find more perfect conditions for the development of leadership?

An additional thought relative to the posi-tion of the architect has been well expressed in the March issue of the Architectural Review, published under the heading of "A Professional Doctrine," which is as follows:

view, published under the heading of "A Professional Doctrine," which is as follows: "The position of the architect as an educative factor in the community is not to be disregarded. Whether he wills it or no, his point of view must always be considerably in advance of the average in the vicinity where he resides. It is impossible to maintain this position without his being forced to educate those in the community with whom he comes in contact. If his cirwith whom he comes in contact. If his cir-cle of influence extends only to his immediate clientage, he is shirking his responsi-bilities; and but rendering his own progress the more precarious, slow and uncertain. The wider the circle that can be affected by his influence, the more rapid and certain the progress of the community—and therefore more rapid the progress of the individual! One of the responsibilities he assumes in undertaking the practice of his profes-sion is to co-operate in all movements whereby the value of his training benefits the municipality in which he has selected to reside or practice. This is a matter of the higher ethics of the profession, which it is inconceivable he should disregard or overlook and maintain his prestige, his community or in his calling. prestige, either or not he receives financial remuneration for such services is aside from the question. In fact, it is doubtful if in many cases he is entitled to such compensation. The debt is entitled to such compensation. The debt owed by the individual to the state or to the city is no less to be recognized than the debt owed to his family and to his parents. One of the important differences that separates the practitioner of a profession of the important differences. sion from the workman following a trade consists in the recognition and acceptance of such ethical obligations; and no archiof such ethical obligations; and no architect can properly maintain his due position in the community unless he not only recognizes, but practices, the gospel of responsibility reiteatred above."

When the above thoughts relative to the architect are duly considered, I cannot but

deplore the fact that we, as an architectural organization do not hold a stronger leading position in the building industries of Chicago. I feel most decidedly that we have not been aggressive enough in obtaining a large membership in this organization, and I would therefore urge upon our Membership Committee of this year, and upon each of you, great activity, for I would like to see every practising architect of Chicago a member of this organization, for I believe that it is not only a privilege but a duty for every architect to join with us in our endeavor to create a better feeling among architects and establish an organization of architects whose object will be the promotion of better business conditions for all

interested in building.

1 believe that an architects feel very much as I do about architectural associations—I believe that we should have a business association so organized that we can immediately and unitedly and in a forceful manner get action on matters which affect our much by the state of the s our mutual interests, and I believe that it is essential that such an association should stand for a high code of ethics and light stand for a fight code of comes and is the way and remove as many obstacles as possible so that the struggling self-interested possible so that the struggling self-interested mass of its members may find it easier and more to their advantage to develop in an upward direction than in a downward direc-tion. But in entering such an association, I do so with some fear in my heart that I will thereby be committing myself to impractical ideal methods of conducting my business that will not work out when put to the test among the exacting and scheming clients with whom I sometimes have business dealings and who may request me business deadings and who may request me to do things which would be contrary to the methods advocated by the association of which I am a member. I am filled with doubt and distrust because I feel that if I doubt and distrust because I feel that if I refuse to do the questionable things that are demanded of me, some other less conscientious architect will do these things and rob me of my commission; but, as I reason further, I am convinced that that form of conduct can only pull a profession and my own practice down and I decide that while I look upon my chosen profession as one which I have primarily selected as a medium for making a living I recognize medium for making a living. I recognize its importance in the development of my community and city and I wish to be counted among those who are not bearing down, but who by boosting are a benefit to the profession, and continued thought satisfies me that I can best do this by joining hands me that I can best do this by joining names with my fellow architects, and, instead of continually growling about bad conditions, put my shoulder to the wheel and add my counsel to that of those who are endeavoring to better existing conditions. My primary object is not to be a reformer or an impractical idealist, but it is to legitimately land as much work as possible, meeting conland as much work as possible, meeting conditions as they exist in accordance with my best judgment and conscience and to educate those with whom I deal so that standards of practice will be benefited. No organization can expect me to sacrifice hundreds or perhaps thousands of dollars, through the loss of a commission, to support an ideal or an ethical point that is so far above common practice as to make it impractical. This organization must educate the public and its supportant. it impractical. This organization must edu-cate the public and its own members to sane cate the phone and its own members to sane and right thinking so that it is not necessary for me to be called upon to make such a sacrifice, and I am willing to contribute my mite in its efforts to attain such a condition. This reasoning I believe to be undirected and the same sacrification. disputable and mere common sense

With a strong membership back of us, great things could be accomplished by this organization, and until that strong membership is obtained, but little respect will be given us by other organizations in the

be given us by other organizations in the building industry who are energetically working for power and influence and whose efforts are eclipsing our own.

In the various labor disputes which unfortunately occur from time to time, every side of the question is represented except. Instrumetely occur from time to time, every side of the question is represented except the side of the public. This organization is the only one that can logically represent the public, outside of the police force and the law courts. Is it then right for us to sit back in these matters and say that we are not interested; that these quarrels only exist among our neighbors and that because among our neighbors and that because we are sometimes called to sit in disputes as the arbitrators of minor questions, we should entirely ignore these real and vital ques-tions? While I have no definite action worked out which would be wise for us to

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pursue in the event of our taking part in who write the specifications and the con-tracts and have intimate relations with the men who build the buildings and who conmen who build the buildings and who control the purse strings and the continuance or discontinuance of building operations, can find some way of forcefully representing and protecting the public in these great struggles. The spirit of the age is organization of the spirit of the age is organization. zation and protection of industrial interests, and we architects have been asleep—dreaming our beautiful dreams and have not given concerted thought and action to business

concerted thought and action to business matters which vitally concern us.

However, all of this is a dream of the future, and is not for this administration to solve, but in as much as the vital point upon which future development of our order. ganization must hang is a large and well organized membership in this association, organized membership in this association, I am satisfied that the main work of this administration should be to increase our membership roll, and I am going to ask each of you to see to it that at least one new member is obtained this year. We will then have done much to facilitate vigorous action when the time seems ripe for future admin-

istrations to take part in any vital question.

We are interested in labor disputes, for they take place in our gardens, trample down our flowers, break our windows and fences, our flowers, break our windows and fences, and it almost seems cowardly for us to continue to say that it is none of our affair; but the fact still remains that it would be very unwise for us to should be continued. but the fact stiff remains that it would be very unwise for us to shoulder additional responsibility by deliberately entering these great disputes before we are backed with an organization which would act with an united front and enforce its convictions with vigor and determination.

The time is not ripe for this association to undertake such a fight, but I am nevertheless satisfied that we will never be fully respected and we will never fully respected ourselves until we have the strength and power to assert ourselves in all matters in which our interests are attacked. Let us then try to grow in strength as rapidly as we can and also let us continue the develop-ment of our judicial minds so that we may act wisely and fairly if the time should ever come when we are looked up to as actual leaders.

#### STANDARD SPECIFICATIONS FOR CEMENT.

BY AMERICAN SOCIETY FOR TESTING MATERIAL.

General Observations.

1. These remarks have been prepared with a view of pointing out the pertinent features of the various requirements and the precautions to be observed in the in-terpretation of the results of the tests.

2. The Committee would suggest that the acceptance or rejection under these specifications be based on tests made by an ex-perienced person having the proper means for making the tests.

Specific Gravity.

Specific gravity is useful in detecting teration. The results of tests of speadulteration. The results of tests of specific gravity are not necessarily conclusive as an indication of the quality of a cement, but when in combination with the results of other tests may afford valuable indications.

Fineness.

The sieves should be kept thoroughly 4. dry.

Time of Setting.

5. Great care should be exercised to maintain the test pieces under as uniform conditions as possible. A sudden change or wide range of temperature in the room in which the tests are made, a very dry or humid atmosphere, and other irregularities vitally affect the rate of setting.

#### Constancy of Volume.

The tests for constancy of volume are divided into two classes, the first normal, the second accelerated. The latter should the second accelerated. regarded as a precautionary test only, So many conditions enand not infallible. ter into the making and interpreting of it that it should be used with extreme care.

7. In making the pats the greatest care should be exercised to avoid initial strains due to molding or to too rapid drying-out during the first twenty-four hours. The pats should be preserved under the most uni-

form conditions possible, and rapid changes of temperature should be avoided.

8. The failure to meet the requirements of the accelerated tests need not be sufficient cause for rejection. The cement may, however, be held for twenty-eight days, and a retest made at the end of that period, using a new sample. Failure to meet the requirements at this time should be considered sufficient cause for rejection, although in the present state of our knowledge it cannot be said that such failure page. be said that such failure necesit cannot sarily indicates unsoundness, nor can the cement be considered entirely satisfactory simply because it passes the tests.

#### SPECIFICATIONS. General Conditions.

 All cement shall be inspected.
 Cement may be inspected either at the place of manufacture or on the work.

In order to allow ample time for inspecting and testing, the cement should be stored in a suitable weather-tight building having the floor properly blocked or raised from the ground.
4. The cement shall be stored in such

a manner as to permit easy access for proper inspection and indentification of each

shipment.

5. Every facility shall be provided by the Contractor and a period of at least tweive days allowed for the inspection and necessary tests.

6 Cement shall be delivered in suitable

packages with the brand and name of manufacturer plainly marked thereon.
7. A bag of cement shall contain 94 pounds of cement net. Each barrel of Portland cement shall contain 4 bags, and each barrel of natural cement shall contain 3 bags of the above net weight.

8. Cement failing to meet the seven-day requirements may be held awaiting the results of the twenty-eight-day tests before

rejection,

9. All tests shall be made in accordance with the methods proposed by the Committee on Uniform Tests of Cement of the American Society of Civil Engineers, presented to the Society January 21, 1903, and amended January 20, 1904, and January 15, 1908, with all conference of the Society Company of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, with all conference of the Society January 15, 1908, and 1908, with all subsequent amendments there-(See addendum to these specifications.)

10. The acceptance or rejection shall be based on the following requirements:

Natural Cement.

- Definition. This term shall be applied to the finely pulverized product resulting from the calcination of an argillaceous limestone at a temperature only sufficient to drive off the carbonic acid gas. Fineness.
- 12. It shall leave by weight a residue of not more than 10 per cent, on the No. 100,
- and 30 per cent, on the No. 200 sieve.

  Time of Setting.

  13. It shall not develop initial set in less than ten minutes; and shall not develop hard set in less than their they there have been set in the set of more than three hours.

Tensile Strength. 14. The minimum requirements for tensile strength for briquettes one square inch in eross section shall be as follows, and the

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retrogression in shall show no

Strength. days (1 day in moist air, 6 days in water)

.250 lbs. days in water).......250 lbs. One Part Cement, Three Parts Standard Ottawa Sand.

7 days (1 day in moist air,

28 days (1 day in moist air, 27 days in water)

...125 lbs. 

in diameter, one-half inch thick at center, tapering to a thin edge, shall be kept in moist air for a period of twenty-four hours.

(a) A pat is then kept in air at normal

temperature.

(b) Another is kept in water maintained

as near 70 degrees F. as practicable.

16. These pats are observed at intervals for at least 28 days, and, to satisfactorily pass the tests, shall remain firm and hard and show no signs of distortion, checking, cracking, or disintegrating.

Portland Coment.

17. Definition. This term is applied to the finely pulverized product resulting from the calcination to incipient fusion of an intimate mixture of properly proportioned argillaceous and calcareous materials, and to which no addition greater than 3 per cent. has been made subsequent to calcination.

Specific Gravity.

Specific Gravity.

18. The specific gravity of cement shall not be less than 3.10. Should the test of cement as received fall below this requirement, a second test may be made upon a sample ignited at a low red heat. The loss in weight of the ignited cement shall not exceed 4 per cent.

Fineness.

19. It shall leave by weight a residue of not more than 8 per cent. on the No. 100, and not more than 25 per cent. on the No. 200 sieve.

Time of Setting.

20. It shall not develop initial set in less than thirty minutes; and must develop hard set in not less than one hour, nor more than ten hours.

Tensile Strength.

21. The minimum requirements for tensile strength for briquettes one square inch in cross section shall be as follows, and the cement shall show no retrogression in 

Strength. ...175 lbs.

days (1 day in moist air, 6 .500 lbs days in water).....

28 days (1 day in moist air, 27

days in water).........600 lbs.
One Part Cement, Three Parts Standard Ottawa Sand.

7 days (1 day in moist air,

days in water)...........200 lbs.
28 days (1 day in moist air, 27
days in water)..........275 lbs.
Constancy of Volume.
22. Pats of neat coment about

22. Pats of neat cement about three inches in diameter, one-half inch thick at the center, and tapering to a thin edge, shall be kept in moist air for a period of twenty-four hours.

(a) A pat is then kept in air at normal temperature and observed at intervals for at

least 28 days.

(b) Another pat is kept in water maintained as near 70 degrees F. as practicable, and observed at intervals for at least 28 days.

A third pat is exposed in any convenient way in an atmosphere of steam, above boiling water, in a loosely closed vessel for five hours.

23. These pats, to satisfactorily pass the

requirements, shall remain firm and hard, and show no signs of distortion, cheeking, cracking, or disintegrating.
Sulphuric Acid and Magnesia.

24. The cement shall not contain more than 1.75 per cent. of anhydrous sulphuric acid (SO), nor more than 4 per cent. of magnesia (MgO).

FILE 620.1.

#### STRENGTH OF MATERIALS.

#### STRESSES.

A stress is a force which acts in the interior of a body and resists the external forces which tend to change its shape. Three kinds of simple stress are produced by forces which tend to change the shape of a body.

They are: Tensile, tending to pull apart, as in a rone; compressing tending to pull apart.

as in a rope; compressive, tending to push together, as in a column; shearing, tending to cut across, as in punching a plate.

The ultimate strength of a material under tension, compression, or shear, is the greatest unit-stress to which it can be subjected. This occurs at or shortly before rupture, and its value is very different for different materials; thus if a bar whose cross-section is A breaks under a tensile stress, P, the ulti-mate tensile strength of the material is

P÷A.
When a small stress is applied to a body a small deformation is produced, and on the removal of the stress the body springs back to its original form. For small stress material, then may be regarded as perfectly

elastie.

Under smaller stresses the deformations are approximately proportional to the forces, or stresses, which produce them, and also approximately proportional to the length of the bar or body.

When the stress is great enough a deformation is produced which is partly permanent, that is, the body does not spring back entirely to its original form on removal of the stress. This permanent part is termed a set. In such cases the deformations are not proportional to the stresses. When the stress is greater still the de-formation rapidly increases and the body

finally ruptures.

A sudden stress, or shock, is more injurious than a steady stress or than a stress

gradually applied.

gradually applied.

The elastic limit is that unit-stress at which the permanent set is first visible and within which the stress is directly proportional to the deformation. For stresses less than the elastic limit bodies are perfectly elastic, resuming their original form on removal of the stress

The working strength of a material is that unit-stress to which it is, or is to be, subjected. For safety, this must not be greater than the elastic limit of the material used. It should be considerably less to allow for possible defects, usually taken at from one-third to two-thirds the average elastic limit.

Factor of safety for a body under stress or for a piece to be designed is the ratio of

or for a piece to be designed is the ratio of the ultimate strength to the working, or the proper allowable working, strength

Fundamental principles of engineering design are stability and economy: First, the structure must safely withstand all the stresses which are to be applied to it; second, the structure must be built and maintained at the lowest possible cost.

The second of these fundamental principles

requires that all parts of the structure should be of equal strength in proportion to the loads which they are required to carry.

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#### FUNCTIONS OF SMALL T DEAMS

	f <sub>s</sub> = 18000 # fc = 700 #												
		(	(d-x) in inches			П	(d-x) in feet						MOM. FT.
d	C.	1.57	2.0 r	2.5 r	3.0r		1.55	2.0r	2.51	30r	VALUE	STEEL	LB3.
3.5	1.29	3.07					255				6750	.38	1730
40	1.48		3.51					.ZPZ			7780	. 43	2260
4.5	1.66	3.95					.33				8620	.48	2860
50	1.85		4.38					.365			9720	.54	3550
5.5	2.03	4.90					.408				9940	.56	4050
6.0	2.22		5.28					.44			11550	.64	5090
6.5	2.40	5.87					.49				10830	.60	5315
6.5	2.40			571					.476		12600	.70	6000
7.0	2.59		6.22					.518			12900	.72	6650
7.0	2.59				613					.511	13600	.76	6950
7.5	2.77	6.84					.57				11500	.64	6540
7.5	2.77			6.6					.55		14400	.80	7900
8.0	2.95		7.8					.595			13900	. 77	8280
80	2.95				7.10					.584	15500	.86	9050
8.5	3.14	7.83					.652				12000	.67	7830
8.5	3.14			7.53					.627		15800	.88	9890
9.0	3.53		8.15					.68			14-650		10000
20	3.33				7,92					.66	17300	.96	11400

The accompanying table for designing small beams of T section is one of a series computed by Francis H. Wright and Magnus Gunderson, to simplify the work of designing a combination concrete and tile floor.

The width of the flange has been assumed at 15 inches, which gives a rib 3 inches wide when ordinary tile 12 inches square is used as a filler. While not intended for thicker ribs the table may be readily used when the ribs are 4 inches thick, giving a flange width of 16 inches, or when the ribs are 5 inches thick, giving a flange width of 17 inches, etc., the increased width being determined by the designer to take care of shear, or to permit the use of more than two reinforcing bars or rods.

To use this table assume a weight per square foot for the floor and the load it is to carry. Multiply by the flange width, that is, by the distance in inches from center to center of rib, and divide by 12. gives the load in pounds per lineal foot of span and then the bending moment in foot pounds can be obtained. After obtaining the bending moment in foot pounds look in the last column (headed, Mom. Ft. Lbs.) and find the bending moment, or the nearest larger bending moment. On the line on which the bending moment is found proceed to the left until figures are found in the section headed (d-x in inches). At the head of the column in which the figures are found is the slab thickness. Continuing to the left, on the moment line, in the first column is found the thickness of the tile in inches, the total floor thickness being the sum of the thickness of the slab and the tile. The steel will be placed in the bottom of the rib so the distance from the bottom to the center of the steel will be equal to the slab thickness.

In the column headed (Comp. Value) is given the amount of compression in the concrete, which is equal to the tension in the steel when the bending moment is equal to the resisting moment. In the column headed (Area Steel) is given the area of the reinforcing steel to be placed in the lower part of the rib. The area is in square inches and at least two bars should be used, the nearest larger commercial size being taken if there is no commercial size of the exact area.

The following example will illustrate the use of the table: A floor to carry 100 pounds live load is to span 14 feet. Assume width of ribs at 4 inches. Merely as a basis for computation assume a slab thickness of 2 inches and a 6 inch tile. The flange width will then be 16 inches and concrete weight 150 pounds per cubic foot. Width of slab=  $12 \times 16 \times 150 \div 144 \times 6 = 33.33$  Hbs. Wt. of rib=4×6  $\times 150 \div 144 = 25$  lbs. Wt. of 6 in. tile=27 lbs. The dead load=33.33+25+27=85.33 lbs. per lineal ft. The live load being 100 lbs. per sq. ft. then 100×16÷12=133.33 lbs. per lineal foot, the total load being, 85.33+133.33=228.66 lbs. The bending moment in foot pounds= $229\times14\times14$ ÷8=5610. The larger moment in the table is 6000 and this calls for a steel area of 0.70 sq. in., which will require two % in, sq. deformed bars. Proceeding to the left we find over 5.71 that the slab over the tile should be 2.5 in. thick and this, with the 6 in tile makes the total floor thickness 8.5 ins., which increases the dead load 12.5 lbs. per sq. ft. Adding this increased weight and going over the calculations again we find that the bending moment has been increased to 5900 ft. lbs. so the design may stand with the 2.5 in. slab and 6 in, tile with 4 in, rib containing two 5% in, deformed bars.

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## STANDARD RULES OF THE MEASUREMENT OF PLASTERING.

Adopted by the Employing Plasterers' Association of Chicago.

#### LATH AND PLASTERING

to be measured by the superficial yard, from floor to ceiling for walls, and from wall to wall for ceiling.

In rooms containing one or more horizontal angles between the floor and ceiling line, the ceiling to be measured from wall to wall, as though all walls were vertical, for contents of ceiling, and from floor to highest point of ceiling for height of wall.

#### OPENINGS.

Openings in plastering to be measured between grounds. No deductions to be made for openings of two feet or less in width. One-half of contents to be deducted for openings two feet or more in width. The contents on all store front openings to be deducted, and the contractor to be allowed one foot six inches for each jamb by the height.

All beams or girders projecting below ceiling line to have one foot in width by total length added for each internal and external angle.

#### CORNER BEADS, ARCHES, ETC.

All corner angles of more or less than 90 degrees, beads, quirks, rule joints, and moldings, to be measured by the lineal foot on their longest extension, and one foot for each stop or miter.

#### CORNICES.

Length of cornices to be measured on walls. Plain cornices of two feet girth or less to be measured on walls by the lineal foot. Plain cornices exceeding two feet girth to be measured by the superficial foot. Add one lineal foot to girt for each stop or miter. Enriched cornices (cast work), by the lineal foot for each enrichment.

Arches, corbels, brackets, rings, center pieces, pilasters, columns, capitals, bases, rosettes, bosses, pendants and niches, by the piece. Ceiling or frieze plates over eight inches wide, by the square foot.

#### COLUMNS.

All columns to be measured by the lineal foot for plain plastered columns.

#### CEMENT WAINSCOTING.

All cement wainscot to be measured by the square foot, openings to be allowed as for plain plaster.

#### GROUNDS.

All grounds for various classes of work to be as follows, unless expressly specified to the contrary: Where metal lath is spoken of it applies to all wire or metal lath.

In accordance with agreements between the International Operative Plasterers' Union and the American Brotherhood of Cement Finishers, it is agreed that Plasterers shall claim and do all exterior and interior plastering, whether of stucco, cement or any patent material, when done in and by the usual methods of plastering, including the covering of all walls, ceilings, soffits, piers, columns, or any part of a construction of any sort, when any part of a construction is covered with any plastic material in the usual methods of plastering.

In accordance with agreements between the International Operative Plasterers Union and the Ceramic, Mosaic and Encaustic Tile Layers and Helpers'International Union, it is agreed that all walls and ceilings upon which a foundation or base coat is put on by the plasterers, ample room shall be allowed for a final coat of not less than three-eighths of an inch, to be put on by the tile layers, to act as a binder and regulator for the float coat upon which the tile is placed.

It is also agreed that the plasterers shall use only sand and cement in the preparations of walls for the work as above stipulated.

It is also agreed that this shall not interfere with the right of the tile layers to do the scratch coating on all small jobs of one or two ordinary sized bath rooms. No scratch coating shall be put on except by mechanics of either trade.

Patching of plastering after other mechanics shall not be done as a part of the contract price.

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#### CONVEYING MACHINERY

By S. F. JOOR, M. E.

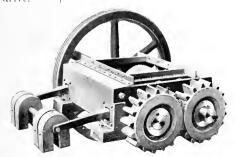
The architect is interested in conveyor machinery principally as adapted to the following purposes:

Coal handling conveyers and ash elevators for power plants; conveyers for handling materials in bulk and packages, in an approximately horizontal direction, or at a reasonable inclination in passing from floor to floor, or else in the form of a vertical elevator for raising and lowering the packages in manufacturing plants. Also equipment for storing raw materials out of doors where large areas are available; these must be treated differently from conveyers used inside of buildings.

Frequently a given type of conveyer is adapted to different purposes by slight changes. For instance, a belt conveyer for coal is largely the same as a belt conveyer for grain or light packages, but the grain conveyer is lighter than that for coal, and the package conveyer is even lighter than that for grain; and if the architect makes his specification for a package conveyer from existing specifications for a coal conveyer the machinery would necessarily cost very much more than otherwise. For this reason the manufacturer should be given full information as regards the service and reasonable restrictions only in the way of construction specifications,

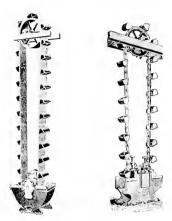
Generally speaking, in small plants it is not desirable to attempt the use of continuous conveyer machinery where the use of a platform elevator for a few hours would give the service required with one or two men. Continuous conveyers are for large plants where the material is to be handled constantly for a considerable period of time each day.

For handling coal the first item to be considered is the total capacity of the plant. Unless a given plant will use at least one railroad car of coal per Jay it is scarcely advisable to attempt the installation of the standard pivoted conveyer, which is described below; and small plants, where the labor conditions and not the actual earning of the conveyer are to be considered, may very well be equipped with the smaller forms of conveyer (vertical bucket elevators and scraper or screw conveyers). Usually these plants should not be equipped with a coal crusher. which is an item involving the expenditure of \$500 to \$1,000 for the complete unit and drive.



Coal Crusher for reducing mine run coal for stokers.

In small plants the ears or wagons should come as close as possible to the boiler room and the transfer, if possible, should be made by a single vertical elevator to the coal storage above the boiler room, which will hold just about a 24-hour run; and such other coal as may come in at any one time may be stored on the ground immediately adjacent to the elevator, unless this space is worth more than the cost for the added capacity of the coal bunker overhead.



Generally speaking, on an average a coal bunker will cost from \$20 to \$30 for each ton of coal to be stored. The larger bunkers run below this average, and the very small cues exceed it.

The least expensive form of bunker is cylindrical, except where supports cause additional expense, this item frequently making it possible to use a square or rectangular bunker at less expense than the cylindrical. In the designing of the space above the boiler floor it is desirable to leave room enough for the coal to be piled above the bunker to a height of half the width of the bunker, and also for a chute to fall at an angle of 45 degrees to the top of this cone or surcharge. Also at least 4 feet should be provided above the upper end of the chute for the head of the elevator. This added space above the bunker is frequently not obtainable, and in this case for small plants a screw conveyor or a chain drag may be used to run horizontally across the bunker, eliminating the space required by the fall of the chute. No part of the bottom or valley should fall less than 32 degrees.

The standard conveyer, where the plant is large enough, occupies less vertical height than any of the other forms and has a longer period of life without any considerable repairs. But if vertical elevators operate at slow speeds, that is, 100 feet per minute or less (as continuous bucket elevators do), and if the chains are made up of reasonably long pitch, so that all of the cost of the chain may be confined to a small number of articulations, these may be made thoroughly lasting. The buckets for the best class of these elevators are made of malleable iron, which resists corrosion better than steel; and the chains should be provided with

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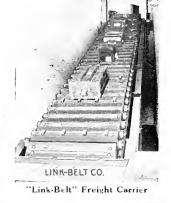
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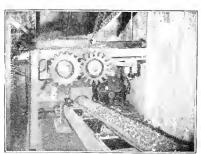
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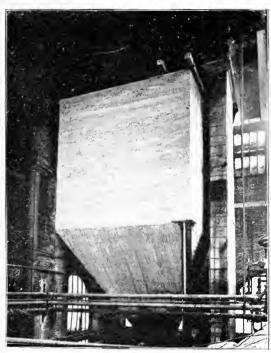
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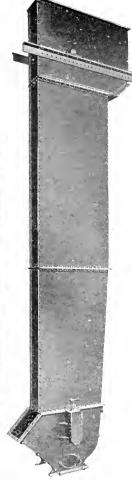


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removable and, if possible, reversible bushings, or knuckles, of such thickness that they they are not likely to break in service.

Bushings <sup>1</sup>s inch to <sup>5</sup>d inch thick are better than none, but these do not last as long as the heavier bushings which have been produced by several manufacturers, being ½ inch to ½ inch thick and so arranged that they may be reversed in the chain and work in both directions. A chain of this character should be good for from five to ten years' service without renewal, where others without bushings would wear out in one year.





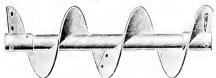
Ash Elevator and with Concrete Case and Concrete Bunker Storage.

For long life, elevator casings, especially where ashes are to be handled, should be made of heavy steel plate or else of reinforced concrete, as the thin sheet plate corrodes in from six months to a year and requires renewal before any of the actual conveyer machinery shows serious wear. No. 10 or No. 12 gauge steel is not sufficient for these casings; they should be 14 inch plate or reinforced concrete. The latter costs but little more than steel plate and, provided with doors for access, is decidedly superior.

In connection with elevators of this type exceedingly heavy screw conveyers make a lasting device and should not be confused with the older form of very light grain conveyor screw, which has so frequently given poor service. The advantage of the screw conveyer is that it occupies but little space and for reasonable horizontal distances forms an inexpensive device, which requires very little attention.

Drag or scraper conveyers, which might be substituted for any screw, demand a good chain, and above it space for the return of the chain. If it is to be constructed to give as long service as the screw it is considerably more expensive.

The above described coal handling equipment is desirable only where the capacity of the plant is comparatively small, and frequently must be considered only as a necessary device for the chimination of labor, regardless of whether there is an actual profit from the installation of the machinery. The standard conveyer can always be sub-



Steel Screw Conveyer.

stituted for this type and should be so substituted if the investment is permissible.

Bucket elevators and screw conveyers of substantial type can be exceed for from \$750 to \$1,500 under ordinary conditions, provided unnecessary expensive features of construction are eliminated. If the installation



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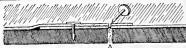
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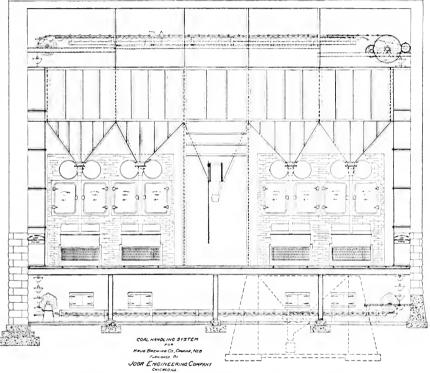
is small the less permanent forms of elevators are permissible and cost less; but a standard conveyer might be installed for as little as \$2,000, say for four boilers.

The standard equipment is made up in two sizes, the first of which is sufficient to handle approximately 30 tons per hour as a maximum. The next larger size will handle as much as 60 tons per hour as a maximum, and either size may be operated at very slow speeds and the life of the conveyer proportionately increased.

The standard conveyer consists of a string of malleable buckets, the lips of which overlap each other, while the buckets are traveling in a horizontal direction. These buckets are pivoted to comparatively long pitch chain, with the result that the bucket always rides with its open top up, except at such

(The older manufacturers of these conveyers do not provide bushings on their chain pins, and the only prejudice against this type of conveyer has arisen from this fact. The result of the absence of bushings making it inevitable that one chain will stretch more rapidly than the other from ash dust falling on the articulations, making it necessary to frequently reassemble parts of the conveyer to make the chains run together. It is also desirable that the rollers should not be a part of the chain articulations.)

The rollers provided for carrying the conveyer on the horizontal run should be arranged for constant lubrication either by the roller containing oil or by some automatic oiling device so arranged that it will not wash ash dust into the wheels. These



Standard Coal and Ash Conveyer (Pivoted Buckets).

times as it may run over the discharger where the material is dumped into the bunkers.

The points to be considered in these conveyers are principally:

Seamless malleable buckets—not steel riveted.

The construction of the chain, which should be very substantial, and should have pins at least 1 inch diameter with long journals (certainly not less than 4 inches in length), and these articulations should be hardened removable bushings or knuckles, allowing for a very considerable amount of wear, and providing a large body of metal

which will not be likely to shear off or break across under the very considerable shocks sometimes coming upon such chains. should not be subjected to the strain due to pulling the conveyer over curves at the top, where sprockets should be used. The rollers are usually the first part of a standard conveyer to require repairs, and the architect should consider whether they are so located as to permit easy renewal when they are worn.

It is also frequently necessary to remove a bucket which may become accidentally damaged, and several builders have arranged the standard conveyer so that this removal is easily accomplished. In any case it should not be necessary to open the chains, as this entails some risk and always a considerable amount of labor.

The lower run of these conveyers should be provided with side plates, forming a con-

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tinuous trough along the lower run to protect the chains and rollers from ash dust, which otherwise would fall on them, and the tracks on the lower run should be mounted on solid cast iron chairs, freeing them from vibration and provided with sufficient space below the conveyer bottoms to allow for cleaning.

The discharger for these standard conveyers must operate without shock, and the relapping device must also operate without shock and with absolute certainty.

The driving sprockets should be of cast steel, if placed at the top, and the idle sprockets at the top should be chilled.

This standard conveyer is the only form which may be satisfactorily used for handling ashes both horizontally and vertically, and where it is necessary to handle ashes in the two directions, if a vertical elevator is used for coal, a cast iron pan conveyer may be used for the handling of ashes and discharge to the same elevator handling coal; but under these conditions it is necessary to discharge the ashes immediately alongside the head of the elevator, as it is very bad practice to attempt to handle the ashes in either a screw conveyer or a drag on the upper run.



A belt conveyer, however, may be used for handling both the ashes and coal, if the ashes are cooled, or if the belt is adapted to handling hot material. Generally speaking, a belt conveyer forms a long-lived de-



Belt Conveyer for Coal,

vice, if very carefully installed and carefully maintained; but the belt itself is a very large part of the value of the machine, and this may be destroyed in a very few

minutes by an ignorant operator who attempts to adjust the tension pulley.

The type of belt which should be used depends upon the service, and if lump coal is to be carried there is nothing so good as a very high class rubber belt, with a thick cushion of pure rubber on the carrying side. The excessive cost of this, however, has caused a great deal of activity in the designing of belts which can be furnished for much less cost and which now have reached a point where, prices considered, they carry as much material as the high class rubber belt.

It is a great mistake in specifying the belts to specify the weight of the canvas forming the belt, which has come to be the practice. The actual weight of the cotton in the canvas has nothing whatever to do with the life of the belt, and the proper requisite is tensile strength combined with some means of maintaining this throughout the life of the belt. The inner stitching of properly constructed canvas belts accomplishes this, in a measure, as it leaves the inner plies of the belt intact even though the upper surface is entirely worn away. And if these belts are properly proportioned to the service, it is probable that one dol-lar's worth of belt will carry more tons of material than the average rubber belt as bought by the average purchasing agent; and it must be said in favor of the canvas belt that it is the least expensive construction on the market. The canvas should have a tensile strength per inch of width varying from 300 to 500 pounds, depending upon whether it is cut near the center of the sheet or near the selvedge edge, the edge of the sheet being much stronger. On account of the edge being the strongest part of the sheet, it is desirable to use belts made up of piles of canvas, each the full width of the belt and not folded. Folded belts are liable to run crooked and cut at the edges, because the softer part of the canvas in the middle of the sheet stretches more than the selvedge edges, which may be located anywhere, if the belt is folded, and the belt from the injuries received in service soon stretches at one side or the other.

The much talked of protection of the eanvas by several nostrums in the way of oils and gums is almost wholly selling talk, but it must be said that linseed oil is largely objectionable on account of its acid qualities. The question of what the gum is on the belt however, may be neglected if it is more or less waterproof and if the belt is properly constructed in the first place.

The belts woven of solid cotton are serviceable if the stitches are locked so that they will not unravel if cut at the edges or worn off on the carrying side, and several of these are on the market with rubber or coal tar treatment, which render them serviceable and adapted to handle reasonably hot material, such as partly quenched ashes.

Cheap rubber filling, however, is objectionable because it is always of the lowest grade and poorly vulcanized, so that it is much shorter lived than the cheaper coal tar gums.

The idlers on which belt conveyers run should be spaced not more than 4 feet apart on the upper run of the conveyers handling coal or ashes, and the lower run should be supported at intervals of from 12 feet to

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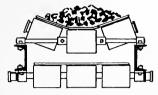
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16 feet. These rollers should be lubricated by compression grease cups, and should be mounted in some sort of fixed alignment frame, and the inclined rollers should have an angle not exceeding 20° preferably, 30° is permissible but objectionable, and more than this cannot be considered as a safe angle because such a bend will cause the belt to split lengthwise.



Section of Belt Conveyer.

The driving pulleys for belt conveyors should be of large diameters, and no pulley on which a belt bends should be less than 4 inches for each ply of thickness of the belt.

Belt conveyers should run at speeds of from 200 feet to 300 feet per minute for handling coal on an economical basis, and are too expensive to use except for plants having a large capacity. Belt conveyers for grain, packages, etc., will be discussed below, and are very much less expensive and made very much lighter than for the handling of heavy bulk materials.

It is frequently noticeable that architects specify "Telescoping Ash Elevators" when the conditions do not actually compel this construction. It should be borne in mind that this telescoping device, while it can be made to operate with reasonable certainty, is a complicated machine, which is expensive in the first place, and gives a comparatively short service before repairs begin to be necessary. There are many situations where the telescoping ash elevator is absolutely the only thing which can be used; but if it is possible to locate an elevator in such a position that it can discharge directly to the wagon by means of a telescoping or folding chute reaching across the side-walk, this should always be done.

For reasonably small plants, ash elevators having malleable buckets of the ordinary form, and operating at speeds of from 180 to 240 feet per min, are permissible; but the life of this device will depend upon the character of the chain used.

Ordinary detachable link chain, where the elevator is used every day for loading one



Inclosed Coal Elevator to Fill Traveling Hopper,

Rubber covered driving pulleys are not of any special benefit except that they permit the builder to use smaller driving pulleys with satisfactory results as long as the rubber covering remains on the pulley, but when this is worn off (as it will be in time), the small driving pulley injures the belt, and for this reason the diameter of the pulley should be very carefully looked into, if it is proposed to cover it with rubber.

All of these remarks refer to belt conveyers adapted for the handling of coal, ashes, gravel and other heavy material.

wagon, will probably last about two years, if it is properly taken care of; but by neglect or if the elevator is frequently used the detachable chain will not last perhaps more than a few months. Where the service is such that a better chain is needed one of the malleable bushed chains is the best device available as regards comparative cost; and if a permanent elevator is required, continuous malleable buckets should be used instead of the ordinary form, and these should be put upon a 12 inch pitch chain, with long heavy bushings allowing ½ or % inch wear

and so arranged that the chain parts, other than the knuckles and pins, will not be subjected to wear. An elevator of this character should be practically a permanent installation, if properly erected, and run at 100 feet per minute or less.

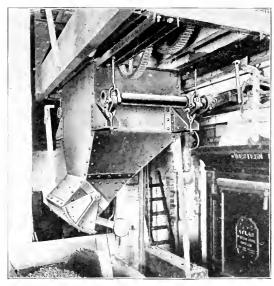
Architects should also provide ample room for the loading boot at the foot of the elevator. It is a common mistake to have the elevator pits made only 2 feet lower than the boiler room floor; whereas, if any form of hopper is required, at least 4 feet should be provided so that it will not be necessary to shovel ashes into the foot of the elevator.

Ample provision should be made where ashes are handled by gravity, for at least 45° slope of all chute or hopper surfaces so that the ashes will flow; 50° to 55° is

very much better.

of stokers and fill same from its spout. This hopper may or may not be fitted with a scale, as desirable; and if a scale is used the exact amount of coal used by the different firemen is readily determinable (frequently a very valuable piece of information).

In the handling of packages the simplest device where packages are transferred to different parts of the same floor is a ball-bearing gravity conveyer, which will carry ordinary boxes and reasonably stiff packages at an inclination varying from one inch to a foot to  $^{1}\mathrm{s}$  inch to a foot, depending upon the weight and class of packages to be handled. These are also frequently made up level so that packages may be pushed along from one operator to another, and this form of conveyer adapts itself to mounting in sections



Weigh Hopper, Coal Discharged direct to Furnace Magazine.

Screw conveyers should never be used for handling ashes for a distance of more than 10 or 12 feet, as the hangers for the screw conveyers are broken by the clinkers and frequently cause breakage of the conveyer, and screw conveyers should also be at least 12 inches and preferably either 16 or 18 inches diameter, and made either of cast iron or of steel not less than  $^{2}s$  inch thick to get reasonable service.

The screw conveyer is not to be recommended for ashes under any condition, except as a last resort. And some form of conveyer where the material is actually borne in cast iron receptacles, such as the pan conveyer, are the only really satisfactory form, except as a combination with coal where the standard coal conveyer described above is used, this being only a different kind of pan.

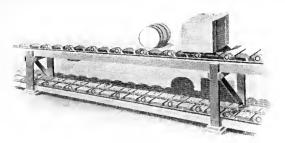
Frequently, especially for office buildings and some compact plants, a very effective means of handling coal is accomplished through a stationary elevator arranged to fill a traveling hopper to run over a line

on easters, which may be set up on different parts of a floor, with very little labor.

Where it is impossible to get the slope to handle materials on gravity conveyers the belt conveyer immediately lends itself to the service, and this can be made up in sections on casters so that it can be moved about with almost the same facility as the gravity type.

The usual construction of belt conveyers for this purpose comprises a woven cotton belt 21 inches to 36 inches wide, run on ball-bearing rollers spaced at intervals of approximately 4 feet. The driving machinery is located under the conveyer and usually consists of a very small electric motor.

These belt conveyers are adapted to handle reasonably heavy packages, and even a half barrel of flour can be transferred on them occasionally; but if heavy materials such as flour, syrup, hardware packages, etc., are to be handled it is advisable to use some form of wooden apron conveyer which is adapted to be operated on a level or on an



Package Conveyer.

inclination up to 40° or thereabouts when provided with pushers to prevent the packages from sliding back.

All of these conveyers are arranged to discharge at the end only, and where it is desirable to run in a continuous circuit, either a combination of conveyers is necessary, one discharging upon another, or some form of flexible wooden apron conveyer, several of which have been designed.

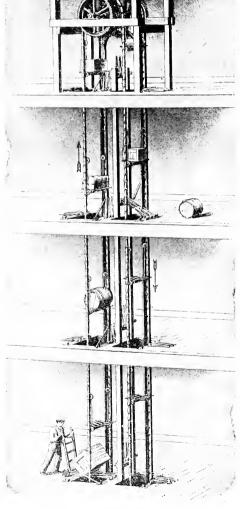
The above described conveyers are not adapted for handling materials directly from any floor to those immediately above, and for this purpose some form of elevator is necessary. The simplest is the inclined arm elevator receiving on one floor and discharging on the next; but where it is necessary to discharge and receive goods on several floors it is necessary to use either an arm elevator with a drop discharge or some form of finger tray elevator. These elevators receive on one side and discharge from the other

Tray elevators can be fitted with an automatic protection to prevent the crushing of packages, by loading on aims which already carry packages from lower floors, and also may be set to discharge a given package at any floor automatically, but these devices are more or less expensive and should not be insisted upon unless absolutely necessary.

There is practically no limit to size to which these elevators can be built, but the architect should specify the maximum and minimum weight and sizes of packages which are to be carried so as to reduce the cost of construction. The life of these elevators is very materially increased by using high class long pitched chains with proper knuckles for the articulation, as described for the coal and ash handling machinery.

In some cases it is less expensive to use a single elevator coming up through several floors, receiving at the bottom and discharging at the top and then to lower the packages either through spiral chutes or through direct drop lowering machines, which will receive packages on one floor and deliver them on a table at a lower floor.

The drop devices are very much less expensive than spiral chutes, and automatically seal themselves against fire in the hatches; also occupy less space than the spiral chute, but the comparative desirability of the two devices depends entirely upon local conditions.



Barrel and Box Elevator.

### SOME SUGGESTIONS ON WIRING SPECIFICATIONS.

By Fred J. Postel .- Consulting Engineer.

Always state whether the wiring is to be for direct or alternating current. If alternating current is to be used and the wiring installed in iron conduit, all the conductors of any one circuit must be enclosed in the same conduit. As any system of wiring may at some future time be changed from direct to alternating current, it is best to so install the wiring that it will be correct for both.

Except in places where the very best material available is desired, New Code wire will in all probability answer the purpose. Until recently the Underwriters had fixed a comparatively low standard for rubber covered wire. As a result, the market was overrun with extremely low grade wire, which was unfit for use anywhere, but which was nevertheless used in large quantities where the specifications merely required that the work conform to the Underwriters' rules. Recently the Underwriters have raised this

Recently the Underwriters have raised this standard very materially, with the result that a new standard of wire, known as "New Code," has been brought out. The poorest New Code wire of today is better than the best Old Code wire. Nevertheless, there is a difference between the different kinds of wire, and, therefore, it is desirable that the specifications should mention at least two brands by name, and that these brands or other brands of the same quality be used. This applies not only to installations where New Code wire is specified, but also where a higher grade of wire is specified.

In specifying wire or any other electrical material, avoid the use of the words, "or equal," as it is extremely difficult to establish the fact that a piece of electrical apparatus is, or is not, the "equal" of the one mentioned in the specification. It is better to use the words "or approved" and then have a general clause stating that "approved" as used in your specification means approved in writing by you.

Wire for "exposed wiring" and for "moulding work" may be either single braid or double braid, but for conduit work, it must be double braid.

It must be kept clearly in mind that the voltage of a circuit has a direct bearing on the quality of the insulation of the wire, and that the higher the voltage, the better the insulation must be. On the other hand, the amperes in the circuit have a direct bearing on the size of the copper conductor—the greater the current, the larger the size of wire required, and vice versa.

Branch circuits must never be less than No. 14 wire. Wires must never be loaded beyond the capacity given in the tables prepared by the Underwriters, and given herewith. It may be found that sizes given in the table will result in an excessive drop in voltage, in which case the size must be increased. A simple formula for figuring the size of wire for direct current circuits is as follows: Circular mills = D x 2 x 10.7 x A

in which D is the distance to the end of the circuit in feet, A equals the amperes of the circuit, and V equals volts lost.

It should be remembered in applying this formula that two volts difference of potential between any two lamps in the building is the maximum allowed in good practice.

For the ordinary circuit wiring met with in laying out the wiring of the average build-

ing, this formula is sufficiently accurate for alternating current circuits, as well.

The location of every outlet should be shown on plans and by the use of symbols it should be indicated whether outlets are combination gas and electric, or electric only. The circuits should also be shown on the plans so that the contractor will know which lights are to be grouped together, as well as the switching arrangements that will be required.

The wiring contractor should be required to properly assemble all the leads in any one outlet box, leaving just two ends for the fixture contractor to make his connections. Wiring contractor should test out the circuits on completion of his work, to insure their being free from grounds and short circuits, and to determine whether switch and fixture outlet connections are properly made.

Circuits must be laid out with not over 12 sockets or receptacles to a circuit. It is better to install not more than 10 to any one circuit, so as to allow for future extensions and possible change in fixtures or style of lamps.

On account of the prevailing practice of using high wattage Tungsten lamps, it has become almost necessary to restrict the number of sockets per circuit to 8 or 10, and in some cases to even a lower number, in order to keep the total watts per circuit down to 660.

Branch circuits must be fused for not to exceed six amperes on 110 volt service, and three amperes on 220 volt service.

Edison fuses are permitted only on circuits of not over 125 volts, and not over 15 amperes.

In the average installation, the fuses used are usually Edison plug fuses on the branch lighting circuits and cartridge fuses on all other circuits. Where link fuses are used they should have copper tips stamped with the rating in amperes. The use of ordinary spool fuse wire should not be permitted.

Fuses of all kinds should always be installed in dust proof and fire proof cabinets.

Wherever fuses are installed, a separate fuse must be installed on each wire of the circuit.

Single pole snap switches must not be used to control more than six 16 c. p. lights, or their equivalent. Where the use of double pole switches does not involve much expense on account of extra wire, their use is recommended, as they entirely disconnect all the wires on the fixture side of the switch, while single pole switches disconnect only one side. Where more than six 16 c. p. lights, or equivalent, are controlled by one switch, double pole switches must be used.

Where it is desired to control lights from two or more points, the wiring should be installed as indicated in the cut. Where lights are controlled from two points only, two three-way switches are used, while the fourway switch is omitted. As many additional points of control as are desired may be had by installing that number of four-way switches, connected as the one in the cut is connected. As three and four-way switches

are single pole, they may be used to control not to exceed six 16 c. p. lamps.

Where wiring is concealed it should always be run in iron conduit. Some cities still permit concealed knob and tube work, but even where so permitted by the authorities, it should not be used.

Exposed wiring may be either open work, wood moulding, metal moulding or conduit.

Flexible metallic cable may be used for "fishing" in old buildings, where a conduit installation would require extensive cutting and tearing up of plaster and wood work.

Where conduit is specified, particular care must be used in the smaller cities, where there is no supervision by the municipal authorities, that ordinary iron pipe is not substituted for conduit, by the contractor.

The ends of the conduit must be carefully reamed to remove all burrs resulting from cutting the pine. Conduit runs should always end in an outlet box. Condulet, Taplet or other similar metal terminal box.

It is advisable to install 42-inch conduit between all points where it is likely that telephone wires will be installed later on, and this conduit work should be included in the wiring specification.

The wiring specifications should include the service leads run in conduit from the outside of the building at a point at least 15 feet above the ground line (where public service is on poles), to the basement, vestibule, or other point readily accessible to meter readers or repair men. At this point the service switch should be installed, meter loops left and the service continued to junction boxes, cutout boxes, etc.

Meter boards of sufficient size to receive the number of meters required should be installed at the point where the meters are to be located. The central station company will set the meters, but the meter board and meter loops should be included in the wiring specifications.

In residences and other cases where only one tenant will occupy the premises, meter loops should be left for one meter only, and the service should be run from the meter directly to the cutout box.

Cutout boxes, whether in residence or flat building work, should be so located that the wiring contractor or repair man can reach them with minimum inconvenience to the tenant, but on the other hand, the entout box must not be located too far from the center of the load. It must be kept in mind that inasmuch as each circuit must be car-

ried to the cutout box, the nearer this box is to the center of the load, the less will be the cost of installing the wiring.

In flat buildings, where a number of tenants will be supplied from the same main service, a branch service lead should be carried from each meter to a cutout box supplying one tenant.

Where any one tenant has a large number of lights, it may be found desirable to install two or more cutout boxes, in which case one service lead may supply all of the cutout boxes, or the service lead may run to a junction box and there divide, one branch running to each cutout box. Local conditions will determine which method is best to follow. In any case, specifications should always state the number and location of cutout boxes, and the plans should indicate the circuits by which these boxes are connected to the meter.

In office buildings or other cases, where a number of tenants may be supplied from one cutout hox, it is often advisable to install a "Metering Panel." Such a panel will simplify the wiring in the cutout her to a great extent.

Cutout boxes may be of wood lined with asbestos, slate or marble, except where used in connection with conduit work, in which case they must be metal lined. High grade construction requires metal cutout boxes in any case, although these boxes may be given a glass or ornamental wood door, provided, of course, that the wood, if used, be protected by the metal.

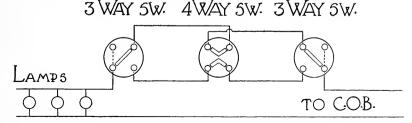
Avoid as far as possible the use of all spring clip devices, which depend on a spring clip for electrical contact or for holding the device in place. There are numerous sockets, bushings, ground clips, etc., on the market, whose only merit is the fact that the contractor can save a few minutes of time in their installation. But the disadvantage in their use is that they are a continuous source of trouble and a fire hazard forever after.

The specification should require that the work must comply with the rules of the National Board of Fire Underwriters and of the Local Bureau having jurisdiction.

This provision is not intended to relieve the architect or engineer of the responsibility for complete and accurate plans and specifications, but is merely to provide against friction with the inspectors of the Insurance Companies or the Local Inspection Bureau.

The specifications should set so high a standard and be so complete and concise that compliance with the specifications would automatically bring the installation up at least to the standard fixed by the Underwriters' rules.

Note—See page 165 City Electrical Regulations for Table of Carrying Capacity of Wires.



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The following data is given to satisfy the need of architects and draftsmen for definite information regarding conditions of manufacture, qualities and sizes of glass which are essential to accurate, practical specification and detail.

WINDOW GLASS is blown glass in distinction from plate or rolled glass. This glass being blown out in cylinders, either by hand or machinery, and the glass cylinders cut and straightened out. Such glass is likely to show a slight bulge and is frequently broken in setting or after setting, on account of the difference in tension between the two surfaces of the glass produced by straightening out or developing the cylinders of glass and not from any fault of the glazier.

Machine-Made "Double Strength" measures about rine lights to the inch in thickness. By far the major portion of all sheet glass on the market is machine made. It is not unusual to find large glazing houses with almost no hand-made glass in stock.

Hand-Made "Double Strength" sheet glass measures about eight lights to the inch in thickness. Inasmuch as it takes about fifteen men to blow and make the same amount of glass as one man with a machine, the purchaser must expect to pay more for handmade than for machine-made glass, but handmade glass of the same grade will show far less defects and is of greater strength.

"AA" Grade Sheet Glass is especially selected glass designed for picture use and is not manufactured in sufficient quantities to supply the demand of the market for Sheet Window Glass, so that where this glass is specified, the glazier usually substitutes "A" grade.

"A" Grade Sheet Glass is the standard quality of Sheet Window Glass used for the glazing of windows in the general run of buildings and is the best quality on the market in sufficient quantities to meet the demands for sheet glass window glazing.

"B" Grade Sheet Glass is an inferior grade, full of air bubbles and other defects, suitable only for cheap factory, greenhouses and similar work.

**PLATE GLASS** is poured and rolled, after which it is polished down on each side to the desired thickness. As it is almost impossible to gauge a polishing machine so that it will polish each end of the sheet the same thickness, plate glass, therefore, varies in thickness from 3/16" to 3g", usually from 44" to 5/16".

CAST OR ROLLED GLASS: This is really not a plate glass but it is a sheet glass and is cast on a table and then rolled, and in order to get the desired thickness what is known as trangs are used on the side of the table to govern the thickness of the glass.

"Rough" Glass gets its name from the rough surface of the table on which the glass is poured and then rolled, the lower surface being rough and the upper surface,

which is the natural surface, being glossy.

"WIRE GLASS" is rolled glass wherein
the wire mesh is mechanically set at equal
distance from each surface during the course
of manufacture.

"Rough Wire" Glass is wire plate glass just as it comes from the rollers, without polishing.

ROUGH, RIBBED, MAZE, ROMANESQUE and SYENITE "WIRE GLASS" determine the style of surface which comes from the use of different figured tables.

POLISHED "WIRE GLASS" is made in the same way as Rough, Ribbed or Maze "Wire Glass" but is rolled in a rough sheet of sufficient thickness to polish down either side after the glass has been properly annealed. Quite frequently the mistake of specifying Polished Plato Wire Glass is made, whereas, Polished "Wire Glass" is taken from a tank furnace by a ladle which does not produce a product as free from bubbles as pouring the glass from a pot furnace as they do in making Polished Plate glass, therefore, specifications should call for Polished "Wire Glass".

RIBBED "WIRE GLASS" is rolled glass with the corrugated or grooved surface on the table side, thus allowing the smooth side of the glass to be glossy.

MAZE "WIRE GLASS" which, by the way, is highly recommended on account of its light diffusive powers is a figured rolled glass and the figure is produced on the table side of the glass, thus leaving the upper surface glossy.

ORNAMENTAL GLASS, which is more commonly known as figured glass, includes the following designs which are most popu-Romanesque, Apex, Pentecor, Maze, Syenite, Florentine, Ondoyant, together with other styles which are known according to the manufacturer's number, such as No. 1, No. 2, No. 3, etc. This style of glass is all rolled, some of the figures being produced on the table surface of the glass, thus leaving the upper surface glossy, while others are produced from a roller which necessitates the figure being on the upper surface and the lower surface of the glass which is flat has a dull appearance. The first mentioned process is by far the best.

"Chipped" Glass may either be chipped plate or chipped sheet glass, as chipping is accomplished by treating the surface of the glass with hot oil and then peeling off same, thus chipping the surface. Double chipping is accomplished by repeating the process, so that the architect when he specifies "chipped" glass should be particular to say whether he wishes sheet or plate, single or double chipped.

"Ground" Glass is produced by grinding the surface of any sort of glass with a sand blast process, so that the architect should specify whether he wants plate or sheet glass when he specified ground glass.



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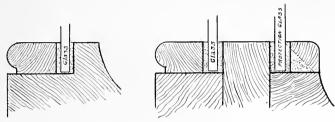
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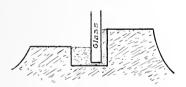
We give below details approved and recommended by the National Ornamental Glass Manufacturers' Association of the United States and Canada as the minimum size of rabbets, jambs and sills for art glass glazing; also details for metal sash and ventila-

tor construction. Rabbets for ordinary window glass glazing should never be less than ¼ of an inch in depth but should always be made at least ¾ of an inch where this is practical from the standpoint of design.

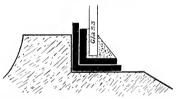


½ size—Single Glazing ½ Size—Double Glazing
Some Details for Stone Omitting Loose Strips





½ Size—Stone Detail for Heads and Jambs



1/2 Size—For Sills and Showing Ventilator Setting

**COLORED GLASS** is produced by introducing various substances into the molten glass and by complicated processes of manufacture, the more expensive glass coming in sheets of irregular shape and thickness, the price varying according to the value of the coloring matter introduced. The precious metals, such as gold and silver, are required for the production of certain colors which necessarily makes these expensive. On account of the big variation in price of the different coloring matter used in the manufacture of opalescent glass, this glass varies in cost according to color.

"Cathedral" Glass measures eight sheets to the inch and is practically uniform in color, this being practically the cheapest colored glass on the market.

"Opal Cathedral" Glass measures about

eight sheets in thickness to the inch and is practically uniform in thickness, but showing in a measure the variation in color of opalescent or opal glass.

Opalescent Glass varies in thickness from 1/16" to 34" and also varies in color almost without limit. It is practically impossible to get exactly the same shade in two successive meltings of opalescent glass; in fact, many of the most beautiful sheets of opalescent glass have been mere accidents of manufacture. Where the art glass cutter and glazier is unable to secure the peculiar shade of color required in cartoon by cutting from any one sheet of glass in his stock he accomplishes this result by plating several sheets over each other, thus by a combination of the colors in the different sheets producing the shade desired.

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"A Revolution in Building Materials"

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The members of the *Chicago Architects' Business Association* are cordially invited to call on our Association for copies of any of these publications that they are interested in.

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### MISCELLANEOUS AND USEFUL INFORMATION CON-CERNING BUILDING ENGINEERING, TRADES AND MATERIALS.

The following pages contain tables, formulae, and miscellaneous information intended to be of assistance to architects in the preparation of plans, specifications, estimates, and the general supervision of the construction work. In order to make the classification simple and to follow a uniform system this matter is classified according to the Dewey System, see page 311, and the file or classification numbers are printed in small type at the head of each piece of matter falling under a different classification. As far as possible the names of authorities quoted are given but in some cases this has been impossible.

FILE 690.12

### RULES AND FORMULAS FOR THE DESIGN OF SIMPLE WOOD BEAMS OR JOISTS.

When a beam is to be designed its length and the loads to which it is to be subjected are known, thus the maximum bending moment may be found.

The allowable-working-strength is assumed in accordance with engineering practice and must not be more than allowed by building laws, locally applicable. This allowable-working-strength is usually stated in municipal codes as a fixed number of pounds per square inch of cross sectional area, for each kind of material. This might just as well be stated in tons or any other unit of weight per square foot or any other unit of area, it being only important that whatever unit of dimension is used that the same unit shall be used both for areas, lengths and breadths.

Breadth-of-the-beam times the-square-of-the-depth divided by six equals Bending-Moment divided by allowable-working-strength per unit of area corresponding with unit of length used for stating the length and breadth of beam.

Bending-Moment (for beams uniformly loaded) equals weight-to-be-supported-perunit-of-length times the-square-of-the-total-number-of-units-of-length divided by eight.

For a simple beam loaded with a single weight, the maximum-Bending-Moment (which is to be used in formula) equals the entire-load times [(the-length-of-the-beam) minus (the-distance-of-the-load-from-the-left-hand-end)] times the-distance-of-the-load-from-the-left-hand-end-of-the-beam divided by the-length-of-the-beam.

If the load be movable the-distance-of-load-from-left-hand-end will be variable and the maximum-moment will be developed when the load is at the middle where the maximum-Bending-Moment is equal to one-fourth-the-load times the-length-of-the-beam. Placing the entire load on a beam at its center therefore produces the maximum strain that it is possible to produce on such beam by any position of such load.

### APPLICATION OF ABOVE PRINCIPLES.

M=maximum bending moment.

S=the tensile or compressive unit stress per square inch allowable by building code or engineering practice for the material selected (See Section 539, Chicago Municipal Code, using the smallest value where there is a difference between compression and tension strength.)

l = length in inches of beam between supports.

b = breadth in inches of the beam.

d = depth in inches of the beam.

w = weight in pounds on beam including the weight of the beam itself per each inch of length.

W = total weight in pounds on beam = 1 w.

### FOR UNIFORM LOADING.

$$b = \frac{3 \le l^2}{4 \ d^2 \ S} = \frac{3 \le l}{4 \ d^2 \ S} = \text{breadth of beam.} \qquad d = \sqrt{\frac{3 \le l^2}{4 \ b \ S}} = \sqrt{\frac{3 \le l}{4 \ b \ S}} = \text{depth of beam.}$$

To find b it is necessary to assume a value for d. Also to find d it is necessary to assume a value for b. In case it is found that the value by formula is too large or too small for practical use, then assumed value must be changed so as to bring the computed value to a practical size.

### LOADS IN POUNDS (UNIFORMLY DISTRIBUTED) TABLE OF STRENGTH OF YELLOW PINE BEAMS

WEIGHT OF BEAM INCLUDED

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Unplastered Construction Width in Inches

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Plastered Construction Width in Inches

				,								
2 in.	3 in.	4 in.	6 in.	8 in.	10 in.	Span	2 in.	3 in.	4 in.	6 in.	8 in.	10 in
6 in. 1	Beam=5	% in. I	load in	pounds.	· · · · · · · · ·	in feet.	6 in.	Beam=	5% in.	Load in	pounds	
1491	2409	3327	5163			5	1491	2409	3327	5163		
1243	2008	2773	4303			6	1243	2008	2773	4303		
1066	1722	2378	3690			7	913	1475	2037	3161		
932	1506	2080	3228			8	699	1129	1559	2419		
828	1338	1848	2868			9	553	893	1233	1913		
746	1205	1664	2582			10	450	727	1004	1558		
678	1095	1512	2346			11	371	599	827	1283		
621	1003	1385	2149			12	310	501	692	1074		
8 in. 1	Beam=7	% in.					8 in. E	Beam=7	% in.			
1955	3158	4361	6767	9173		7	1955	3158	4361	6767	9173	
1711	2764	3817	5923	8029		8	1711	2764	3817	5923	8029	
1523	2460	3397	5271	7145		9	1351	2182	3013	4675	6337	
1370	2213	3056	4742	6428		10	1094	1767	2440	3786	5132	
1245	2011	2777	4309	5841		11	905	1462	2019	3133	4247	
1141	1843	2545	3949	5353		12	761	1229	1697	2633	3569	
1053	1701	2349	3645	4941		13	647	1045	1443	2239	3035	
978	1580	2182	3386	4590		14	559	903	1247	1935	2623	
914	1476	2038	3162	4286		15	488	788	1088	1688	2288	
856	1383	1910	2964	4018		16	428	691	954	1480	2006	
10 in.	Beam=	9% in.					10 in.	Beam=	=9% in.			
2709	4376	6043	9377	12711	16045	8	2709	4376	6043	9377	12711	1604
2426	3919	5412	8398	11384	14370	9	2426	3919	5412	8398	11384	1437
2183	3526	4869	7555	10241	12927	10	2183	3526	4869	7555	10241	1292
1986	3208	4430	6874	9318	11762	11	1803	2913	4023	6243	8463	1068
1820	2940	4060	6300	8540	10780	12	1518	2452	3386	5254	7122	899
1677	2709	3741	5805	7869	9933	13	1292	2087	2882	4472	6062	765
1560	2520	3480	5400	7320	9240	14	1117	1804	2491	3865	5239	661
1454	2349	3244	5034	6824	8614	15	972	1570	2168	3364	4560	575
1365	2205	3045	4725	6405	8085	16	855	1381	1907	2959	4011	506
1284	2074	2864	4444	6024	7604	17	757	1223	1689	2621	3553	448
1212	1958	2704	4196	5688	7180	18	676	1092	1508	2340	3172	400
1149	1856	2563	3977	5391	6805	19	606	979	1352	2096	2840	358
1092	1764	2436	3780	5124	6468	20	546	882	1218	1890	2562	323

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2140         3440         4740         6080         7350         9930         12650         15200         15         1600         2590         3570         4550         5540           1990         3210         4440         5660         6900         9340         11800         14250         16         1405         2270         3140         4000         4860           1870         3025         4160         5330         6490         8760         11050         13380         17         1250         2020         2790         3550         4325           1770         2860         3950         5050         6120         8300         10500         12700         18         1115         1795         2490         3160         3850           1670         2700         3740         4760         5800         7850         9900         12000         19         1000         1615         2230         2840         3455           1590         2575         3550         4530         5500         7480         9430         11400         20         900         1450         2000         2555         3110           1530         2450         3400 <t< td=""><td></td><td>13150</td></t<>		13150
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		11450
1770         2860         3950         5050         6120         8300         10500         12700         18         1115         1795         2490         3160         3850           1670         2700         3740         4760         5800         7850         9900         12000         19         1000         1615         2230         2840         3455           1590         2575         3550         4530         5500         7480         9430         11400         20         990         1450         2000         2555         3110           1530         2450         3400         4335         5280         7200         9900         10900         21         810         1320         1820         2320         2820           1450         2350         3250         4150         5050         6850         8650         10300         22         745         1200         1660         2120         2580		10080
1670         2700         3740         4760         5800         7850         9900         12000         19         1000         1615         2230         2840         3455           1590         2575         3550         4530         5500         7480         9430         11400         20         900         1450         2000         2555         3110           1530         2450         3400         4335         5280         7200         9000         10900         21         810         1320         1820         2320         2820           1450         2350         3250         4150         5050         6850         8650         10300         22         745         1200         1660         2120         2580	5860 7400	8980
1590         2575         3550         4530         5500         7480         9430         11400         20         900         1450         2000         2555         3110           1530         2450         3400         4335         5280         7200         9000         10900         21         810         1320         1820         2320         2820           1450         2350         3250         4150         5050         6850         8650         10300         22         745         1200         1660         2120         2580	5210 6580	8000
1530         2450         3400         4335         5280         7200         9000         10900         21         810         1320         1820         2320         2820           1450         2350         3250         4150         5050         6850         8650         10300         22         745         1200         1660         2120         2580	4695 5910	7150
1450         2350         3250         4150         5050         6850         8650         10300         22         745         1200         1660         2120         2580	4220 5325	6450
	3840 4840	5840
	3500 4410	5340
	3200 4040	4870
	2940 3710	4500
14 in. Beam = 13% in. 14 in. Beam = 13% iu.		
4000 6450 8900 11400 13850 18700 23700 28700 11 4000 6450 8900 11400 13850 3660 5900 8150 10400 12650 17150 21600 26200 12 3660 5900 8150 10400 12650		28700
		26200 24200
		22500
		19700
		17200
2590 4170 5760 7350 8940 12150 15300 18500 17 2125 3440 4750 6050 7360	9950 12600 1	15210
2440 3940 5450 6940 8430 11410 14410 17450 18 1900 3070 4250 5410 6580	8930 11250 1	13600
2310 3740 5160 6590 8000 10810 13650 16550 19 1700 2740 3790 4840 5880	7960 10100 1	12150
2195         3550         4900         6240         7600         10260         13000         15700         20         1535         2480         3425         4370         5320	7200 9090 1	11000
2090 3360 4660 5940 7240 9800 12390 14950 21 1395 2255 3120 3980 4840		10000
2000 3250 4450 5700 6900 9400 11900 14300 22 1270 2050 2830 3600 4400	5950 7500	9100
1900         3090         4250         5430         6600         9000         11350         13700         23         1160         1870         2590         3300         4000           1830         2950         4090         5200         6320         8600         10900         13100         24         1070         1720         2370         3070         3690	5450 6850	8300
	5000 6300	7600
16 in. Beam $= 15\%$ in. 16 in. Beam $= 15\%$ in.		
	20800 26400 3	
		29380
		27400
		25640 22790
		20250
		18180
<del>  </del>	10750 13550 1	
2740         4425         6110         7800         9430         12850         16200         19600         21         2080         3360         4640         5925         7200	9755 12310 1	14900
2610         4220         5825         7445         9050         12250         15490         18700         22         1895         3065         4240         5400         6560	8900 11230 1	13580
2500 4045 5590 7125 8660 11740 14810 17900 23 1740 2805 3880 4950 6025		12430
2400 3890 5370 6850 8150 11300 14300 17200 24 1600 2570 3580 4580 5580 2300 3720 5150 6550 8000 10900 13700 16500 25 1470 2370 3300 4200 5100		11400
200 200 200 200		0700
	0400 8100	3100
18 in. Beam = 17% in.  18 in. Beam = 17% in.		
4875 7860 10860 13860 16880 22850 28850 34950 15 4875 7860 10860 13860 16880 4560 7370 10180 13000 15800 21400 27000 32650 16 4560 7370 10180 13000 15800		
4300         6950         9580         12210         14895         20180         25300         30750         17         4300         6950         9580         12210         14895           4050         6550         9040         11520         14000         19000         24000         29000         18         4050         6550         9040         11520         14000		
3840 6210 8560 10930 13300 18030 22800 27500 19 3640 5880 8110 10350 12550		
<del> </del>	15400 19450	
	14200 17950	
20 020 1000 11110	12750 16100	
3470         5610         7750         9890         12030         16300         20600         24850         21         3040         4900         6760         8630         10500	11900 15000	
3470         5610         7750         9890         12030         16300         20600         24850         21         3040         4900         6760         8630         10500           3310         5350         7400         9450         11460         15550         19630         23750         22         2730         4400         6090         7750         9410		
3470         5610         7750         9890         12030         16300         20600         24850         21         3040         4900         6760         8630         10500           3310         5350         7400         9450         11460         15550         19630         23750         22         2730         4400         6090         7750         9410           3170         5120         7060         9000         10950         14850         18750         22650         23         2545         4110         5660         7230         8800           3040         4920         6800         8625         10520         14260         18000         21800         24         2290         3700         5100         6510         7900	10700 13550	16400
3470         5610         7750         9890         12030         16300         20600         24850         21         3040         4900         6760         8630         10500           3310         5350         7400         9450         11460         15550         19630         23750         22         2730         4400         6090         7750         9410           3170         5120         7060         9000         10950         14850         18750         22650         23         2545         4110         5660         7230         8800		15100

# TABLES OF WORKING STRESSES IN ORDINARY STRUCTURAL DESIGN

By Benjamin E. Winslow, M. W. S. E.

The tables and data given on pages 272, 273 and 274 are extracts from articles published by Mr. Winslow in "The Technograph"—(Editor)

# ULTIMATE AND SAFE STRENGTH OF CONCRETE IN POUNDS PER SQUARE INCH

Modulus of Ela	Modulus of Elastleity of P. C.	Modulus of Elasticity	Strength ot	Compr	Compression on Top Fibers of Beams	n Top ams	Modu	Modulus of Elastleity
Stone Concrete Old for Vari	Stone Concrete 1:2:4-60 Days Old for Various Stresses		1:2:4 P. C. Stone Concrete for Various Ages	Ultimate	ate	Sıfe	Ultin	Ultimate
		Ultimate		From	To	Av.	From	To
Initial Mod. of Elasticity	Elasticity	2,000,000	1 Day Old	200	300	0		
E. for Stress of 400 lbs pr. $\square$	400 lbs pr.	1,700,000	2 " "	400	200	100		
"	., ,, 009	1,600,000		009	1000	200	800,000	1,300,000
"	,, ,, 008	1,500,000	" " , , 2	006	1500	375	1,200,000	2,000,000
**	., ,, 0001	1,400,000	1 Month Old	1200	2000	200	1,600,000	2,600,000
3 3	1200 "	1,300,000	2 " "	1400	2300	575	1,800.000	3,000,000
:	1400 ''	1,100,000	3, ,, ,,	1500	2500	625	2,000,000	3,300,000
" "	., ., 0091	000,006	, ,, ,, 9	1600	2700	675	2,200,000	3,600,000
"	1800 "	000,009	1 Year Old	1700	2900	725	2,300,000	3,800,000
E. for Ultimate	E. for Ultimate Strength	0		1800	3000	750	2,400,000	4,000,000

These tables will cover variations of the material and give the range of strength that could be expected of good ordinary materials and workmanship. Inferior materials will come below the lowest limits given in these tables, and superior materials will come above the highest limits. The safe compressive unit stress to be used for long columns should be obtained from the use of some approved column, formulae, which also should take care of possible eccentric applications of the load.

many storled building. The safe extreme fiber stress for long, narrow beams and girders, including plate girders, not braced sideways, should also be obtained from some approved column formulae. In this manner the lateral strength of beams is

provided for.

The following method is believed to conform with good practice for computing loads in buildings:
Figure all parts of the building for the full dead load.
Figure joists and beams for the full live load.

Figure girders for \$5 to 90 per cent of the live load. Figure the columns supporting the roof and top story of a building for the full live load. For each succeeding story below, make a reduction of 5 per cent in the full live load coming on the columns. This reduction must however, not exceed 50 per cent of the full live load for a

y storied building. Figure the foundations for one-third of the full live load.

ULTIMATE AND SAFE STRENGTH OF MASONRY IN POUNDS PER SQUARE INCH.

	ŭ	Compression	lon	Safe	o sninboM	Modulus of Elasticity		Shear			Tension		Weight per	t per
MATERIAL	Ultir	Ultimate	Safe	Bear- ing	Ulti	Ultimate	Ultimate	nate	Safe	Ultir	Ultimate	Safe	Cubic	Foot
	From	To	Av.		From	To	From	To	Av.	From	To	Av.	From	T,o
Hard Brick Work in P. C.	2000	3000	200	275	1.500.000	2 500.000				100	200	20	130	150
	1500	2500	175	250	1,500,000	2,500,000	150	300	20	100	200	ຄິຄ	110	130
z	1000	2000	150	200	1,000,000	1,500,000	:	:	:	20	100	10	110	130
L.M.	800	1600	100	150	500,000	1,000,000	:	:	:	20	40	ນ	110	130
" P.C.	1000	2000	150	200	1,000,000	1,500,000	:	:	:	50	100	10	110	130
Old Brick Work in P. C.	2000	3000	200	275	2,000,000	3,000,000	:		:	120	250	25	110	130
	1500	2500	175	250	1,500,000	2,000,000	:	:	:	20	120	15	110	130
ا: :	1000	2000	150	200	1,000,000	1,500,000	:	:	:	53	SO.	7	110	130
Brick Piers in P. C	1500	2500	175	250	1,500,000	2,500,000	:	:	:	100	200	50	110	130
	800	1600	100	150	500,000	1,000,000	:	:	:	23	9	ນ	110	130
Rubble Work in P. C	1000	2000	150	200	1,500,000	2,500,000	:	:	:	20	150	20	130	150
Coursed Rubble in P. C	1500	2500	175	250	2,000,000	3,000,000	:	:	:	100	200	50	140	160
Neat P. C	2000	4000	200	300	-	3,000,000	1200	2400	300	400	800	20	8	8
Neat N. C	1000	3000	175	250		2,000,000	200	1500	125	200	400	30	09	20
P. C. Mortar 1:3	1500	2500	175	250		2,000,000	200	400	35	200	400	30	120	130
N. C. Mortar 1:2	800	1500	• 150	200	_	1.500,000	150	300	25	100	200	20	120	130
Aorta	200	400	100	150	500,000	800,000	20	100	10	20	9	w	8	110
P. C. Stone Concrete 1:2:4	1500	3500	904	200	1,500,000	3,500,000	800	1200	125	200	400	40	140	150
:	1000	2000	200	300	1,000,000	2,000,000	. 500	1000	8	150	300	25	140	150
P. C. Cinder 1:2:5	800	1600	150	200	500,000	1,000,000	20	120	10	<u>8</u>	150	20	100	110
Granite	12000	20000	400	009	3,000,000	6,000,000	1200	2400	300	1200	2400	200	160	180
Limestone	0009	12000	350	200	2,000,000	5,000,000	1000	2000	175	1000	2000	175	150	170
Sandstone	2000	10000	300	400	1,000,000	3,000,000	800	1600	125	800	1660	125	140	160
Brick and Tile	0000	0002	000	000	0000	000000		000	000	000		0.0	•	•

Ultimate and Safe Strength of Wood in Pounds Per Square Inch

	Ext	Extreme Fiber Stresses	ber	Com	Compression with the Grain	with	Compi	Compression Across the Grain	cross	Modulus of	Modulus of Elasticity	Weight per	ber .
MATERIAL	Ulti	Ultimate	Safe	Ulti	Ultimate	Safe	Ultimate	nate	Safe	Ultimate	nate	Capie	1001
	From	$T_{\rm o}$	Av.	From	$_{\rm C}$	Av.	From	To	Av.	From	To	From	To
Long Leaf Pine	2000	14000	1500	0009	0006	1500	1000	2000	350	1,500,000	2,250,000	40	50
Oregon Pine	2000	13000	1400	0009	0006	1400	200	1800	300	1,400,000	2,100,000	35	45
White Oak	0009	12000	1300	2000	8000	1300	1500	3000	500	1,300,000	1,950,000	45	55
Short Leaf Pine	0009	11000	1200	2000	8000	1200	900	1800	300	1,200,000	1,800,000	35	45
Spruce	2000	10000	1100	000 <del>+</del>	2000	1100	800	1600	250	1,100,000	1,650,000		40
Norway Pine	2000	0006	1000	000+	0009	1000	202	1400	200	1,000,000	1,500,000	30	40
White Pine	4000	8000	906	000+	0009	006	99	1200	200	900.006	1,350,000	33	30
Fire	900+	2000	800	3000	2000	800	909	1200	200	000,008	1,200,000	22	30
Hemlock	3000	0009	700	3000	4000	700	009	1200	200	700,000	1,050,000	53.	30
Cedar	3000	2000	009	3000	1000	009	500	1000	200	000,009	900.000	8	25
	She	Shear with the Grain	the	Sh	Shear Across the Grain	SS	Tens	Tension with the Grain	the	Elastic	Elastic Limit	lo s	
MATERIAL	Ulti	Ultimate	Safe	Ulti	Ultimate	Safe	Ulti	Ultimate	Safe	Ultimate	nate	ulut 19ilii	
	From	To	Av.	From	$_{ m C}$	Av.	From	To	Av.	Frcm	To	Moo Res	
Long Leaf Pine	400	800	150	4000	0009	1000	8000	15000	1700	0009	12000	3.0	
Oregon Pine	400	200	140	000+	2000	900	8000	14000	1600	0009	11000	3.0	
White Oak	9	1000	200	4000	0009	906	2000	14000	1500	2000	11000	3.0	
Short Leaf Pine	350	200	120	3000	2000	800	2000	13000	1400	5000	10000	2.5	
Spruce	300	9	110	3000	000+	008	9009	12000	1300	4000	0006	2.5	
Norway Pine	300	909	100	3000	4000	200	0009	11000	1200	4000	8000	2.5	
White Pine	300	99	06	2000	3500	009	2000	10000	1100	3500	2000	2.0	
Firm	250	200	96	2000	3000	200	2000	10000	1000	3000	0009	2.0	
Hemiock	200	001	0.7	0007	0000	200	000+	9006	906	2500	5000	0,	
Cedal	200	400	3	2000	0002	9	4000	2000	200	72000	4500	1.5	

### SQUARE MEASURE.

144 square inches = 1 square foot.
9 square feet = 1 square yard.
272\frac{1}{2} feet = 1 square rod or pole.
40 rods = 1 square rood.
4 roods
160 rods
4,840 yards.
43,560 feet
10 square chains
640 acres = 1 square mile.

2,471 acres = 1 hectare.
7,840 square yards = 1 Irish acre.
6150 square yards = 1 Scotch acre.
30 square acres = 1 yard of land.
100 acres = 1 hide of land.
40 hides = 1 barony.
36 sq. miles = 1 township.
640 acres = 1 section.
About 14 25x125 ft. lots = 1 acre.

### SOLID OR CUBIC MEASURE.

1728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.
40 cubic feet of rough or 50 cubic feet of hewn timber = 1 ton or load.

108 cubic feet = 1 stack of wood. 128 cubic feet = 1 cord of wood. 40 c. ft. = 1 U. S. A. shipping ton. 42 c. ft. = 1 British shipping ton.

### AVOIRDUPOIS WEIGHT.

16 drachms = 1 ounce. 16 ounces = 1 pound. 28 pounds = 1 quarter. 112 pounds = 1 ewt. 20 ewt. = 1 ton.

### TROY WEIGHT.

24 grains = 1 dwt.20 dwt. = 1 oz. 12 oz. = 1 lb.

### SIZES OF PAPER (Whatman's).

Inches.	Inches.
Emperor	Royal24 x 19
Antiquarian53 x 31	Medium
Double elephant $40 \times 26\frac{3}{4}$	Demy
Atlas34 x 26	Large post $\dots 20\frac{3}{4} \times 16\frac{3}{4}$
Colombier	Post
Imperial	Foolscap
Elephant	Post
Super royal	Copy20 x 16

### Water.

1 cubic foot of water equals 62.5 pounds, or 7.48 U.S. gallons.

1 cubic inch of water equals .036 pounds.

1 cubic foot of water equals 6.2355 Imp. gallons or 7.48 U.S. gallons.

1 cylindrical foot of water equals 49.1 pounds or 5.89 U.S. gallons.

1 U.S. gallon of water equals 8.34 pounds.

1 U. S. gallon of water equals 231 cubic inches.

1 pound pressure per square inch is equivalent to a head of water of 2.3093 feet; 1 pound—27.71 inches; 14.7 pounds or 1 atmosphere—33.947 feet, or 10.347 metres; 0.433 pound or 1 atmosphere—1 foot; 43.3 pounds—100 feet.

### Gauges and Their Equivalents.

No.	27,	equal	to	$\frac{1}{6}\frac{1}{4}$	inch.	1 1	Jo.	12,	equal	to	-7 <sub>F</sub>	inch.
	21,	* *	4.6	1 9 9	6.6				4.6			
" "	18,	4.6	6 6	3. 6.1	66				4 6			
4.4	16,	66	4.6	1 6	6.6				6.6			
		6.6							4.6			
4.6	13,	"	"	$\frac{3}{2}$	"				**			

### Metric Tables.

Approxima Equivalen	
1 inch [length] $2\frac{1}{2}$	cubic centimeters 2.539
1 centimeter $\dots \dots \dots$	inch 0.393
1 yard 1	meter 0.914
1 meter (39.37 inches) 1	yard 1.093
1 foot	centimeters 30.479
1 kilometer (1,000 meters) §	mile 0.621
1 mile $1 \frac{1}{2}$	kilometers 1.600
1 gramme [weight] $15\frac{1}{2}$	grains
1 grain 0.064	gramme 0.064
1 kilogramme (1,000 grammes) 2.2	pounds avoirdupois 2.204
1 pound avoirdupois $\dots$ $\frac{1}{2}$	kilogramme 0.453
1 ounce avoirdupois $(437\frac{1}{2} \text{ grains}) \dots 28\frac{1}{3}$	grammes
1 ounce troy, or apothecary (480 grains) 31	grammes31.103
1 cubic centimeter[bulk] 1.06	cubic inch 1.060
1 cubic inch	cubic centimeters16.386
1 liter (1,000 cubic centimeters) 1	U. S. standard quart 0.946
1 United States quart 1	liter 1.057
1 fluid ounce	cubic centimeters29.570
1 hectare (10,000 square meters) [surface] $2\frac{1}{2}$	acres 2.471
1 acre 0.4	hectare 0.40

In the nickel five-cent piece of our coinage is a key to the tables of linear measures and weights. The diameter of this coin is two centimeters, and its weight is five grammes. Five of them placed in a row will give the length of the decimeter, and two of them will weigh a decagram. As the kiloliter is a cubic meter, the key to the measure of length is also the key to the measure of capacity.

### Handy Table.

Diameter of a circle  $\times$  3.1416 = circumference. Radius of a circle  $\times$  6.283185 = circumference. Square of the diameter of a circle  $\times 0.7854 = area$ . Square of the circumference of a circle  $\times 0.07958 =$  area. Half the circumference of a circle  $\times$  half its diameter = area. Circumference of a circle  $\times 0.159155 = \text{radius}$ . Square root of the area of a circle + 0.56419 = radius. Circumference of a circle  $\times$  0.31831 = diameter. Square root of the area of a circle  $\times 1.12838 =$  diameter. Diameter of a circle  $\times$  0.86 = side of inscribed equilateral triangle. Diameter of a circle  $\times 0.7071 = \text{side of an inscribed square.}$ Circumference of a circle +0.225 = side of an inscribed square. Circumference of a circle  $\times 0.282 =$  side of an equal square. Diameter of a circle  $\times 0.8862 = \text{side}$  of an equal square. Base of a triangle  $\times \frac{1}{2}$  the altitude = area. Multiplying both diameters and .7854 together = area of an ellipse. Surface of a sphere  $\times \frac{1}{6}$  of its diameter = solidity. Circumference of a sphere  $\times$  its diameter = surface. Square of the diameter of a sphere  $\times 3.1416 = \text{surface}$ . Square of the circumference of a sphere  $\times 0.3183 = \text{surface}$ . Cube of the diameter of a sphere  $\times 0.5236 =$  solidity. Cube of the radius of a sphere  $\times 4.1888 =$  solidity. Cube of the circumference of a sphere  $\times$  0.016887 = solidity. Square root of the surface of a sphere  $\times 0.56419 = \text{diameter}$ . Square root of the surface of a sphere +1.772454 = circumference. Cube root of the solidity of a sphere  $\times 1.2407 =$  diameter. Cube root of the solidity of a sphere  $\times 3.8978 = \text{circumference}$ .

Radius of a sphere  $\times 1.1547 = \text{side of inscribed cube.}$ 

Square root of  $(\frac{1}{8})$  of the square of) the diameter of a sphere = side of inscribed cube. Area of its base  $\times \frac{1}{8}$  of its altitude = solidity of a cone or pyramid, whether round, square, or triangular.

Area of one of its sides  $\times$  6 = surface of a cube.

Altitude of trapezoid  $\times \frac{1}{2}$  the sum of its parallel sides = area.

### TABLE OF SQUARE ROOTS.

No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.
25	5.	650	25.46	1400	37.42	2600	50.99
50	7.071	700	26.46	1450	38.08	2700	51.96
75	8.66	750	27.39	1500	38.73	2800	52.91
100	10.00	800	28.28	1550	39.37	2900	53.85
125	11.18	850	29.15	1600	40.00	3000	54.77
150	12.25	900	30.00	1650	40.62	3200	56.57
175	13.23	950	30.82	1700	41.23	3400	58.30
200	14.14	1000	31.62	1800	42.43	3600	60.00
250	15.81	1050	32.40	1900	43.59	3800	61.64
300	17.32	1100	33.16	2000	44.72	4000	63.24
350	18.70	1150	33.91	2100	45.82	4200	64.80
400	20.00	1200	34.64	2200	46.90	4400	66.32
450	21.21	1250	35.36	2300	47.95	4600	67.82
500	22.36	1300	36.06	2400	48.99	4800	69.28
550	23.45	1350	36.74	2500	50.00	5000	70.72
600	24.49						
-				4.3 3 4 4			

Dimensions of a Barrel.—Diameter of head, 17 inches; bung, 19 inches; length, 28 inches; volume, 7,680 cubic inches.

### Expansion of Water (Dalton).

Temperature.	Expansion.	Temperature.	Expansion.	Temperature.	Expansion.
220	1.0009	720	1.0018	1520	1.01934
32 *46	1	$\begin{array}{c} 92 \\ 112 \end{array}$	1.00477 1.0088	172 192	$1.02575 \\ 1.03265$
52	1.00021	132	1.01367	212	1.0466

\*Greatest density at 39.1° Fahr.

A box 24 inches long by 16 inches wide and 28 inches deep will contain a barrel, or three bushels; 24 by 16 inches and 14 inches deep contains half a barrel; 16 inches square and  $8\frac{2}{5}$  inches deep will contain one bushel; 16 by  $8\frac{2}{5}$  inches and 8 inches deep will contain half a bushel; 8 by  $8\frac{2}{5}$  inches and 8 inches deep will contain one peck; 8 inches square and  $4\frac{1}{5}$  inches deep will contain one gallon; 7 by 4 inches and  $4\frac{4}{5}$  inches deep will contain one quart; 4 feet long, 3 feet 5 inches wide and 2 feet 8 inches deep will contain one ton of coal, or 36 cubic feet.

Table Showing the Pressure of Water at Different Elevations.

Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Iuch	Feet Head.	Equals Pressure per Square Inch	Feet Head	Equals Pressure per Square Inch.	Feet Head.	Equals Pressure per Square Inch	Feet Head	Equals Pressure per Square Inch
1 5 10 15 20 25 30 35 40 45 50 55 60	43 2 16 4 33 6 49 8 .66 10 .82 12 99 15 .16 17 .32 19 49 21 .65 23 .82 25 99	65 70 75 85 90 95 100 105 110 115 120	28.15 30.32 32.48 34.65 36.82 38.98 41.15 43.31 45.48 47.64 49.81 51.98 54.15	130 135 140 145 150 155 160 165 170 175 180 185	56.31 58.48 60.64 62.81 64.97 67.14 69.31 71.47 73.64 75.80 77.97 80.14 82.30	195 200 205 210 215 220 225 230 235 240 245 250 255	84 47 86 63 88 80 90 96 93 14 95-30 97-49 99-63 101-79 103-96 106 13 108 29 110 46	260 265 270 275 280 285 290 295 300 310 320 330 340	112 62 114 79 116.96 119.12 121.29 123.45 125 62 127.78 129.95 134.28 138 62 142 95 147 28	350 360 370 380 390, 400 500 600 700 800 900	151 61 155.94 160.27 164.61 173.27 216.58 259.90 303.22 346.4 389.86 433.18

# Some of the Physical Properties of Metals-Compiled from the Best Authorities.

							1	V1.	١ ١	CI	XL.	ΑL	٠٥,	•							
Approximate price per ib. avoirdupois.		\$ 16.30	0.36	1.95	3.26	0.23	299.72	466.59	0.015	90.0	45.30	108.72	1.00	5.80	122.31	22.65	18.60	3.26	0.025	0.25	0.10
Malleability, Gold being 1.		:	:	:	:	00	1	:	æ	9	:	:	:	s.	73	:	εı	:	:	÷	7
Ducility, Gold being 1.	:	:	:	:	:	ဗ	Ţ	:	+	s.	:	:	:	5	::	:	ดา	:	:	œ	7
Density.	:	:	:	10.035	8.217		:	:	:	10.370	:	:	:	:	:	:	:	:	:	7.025	9.18
Hardness, the Diamond3010.		821	:	:	092	1360	979	186	1375	570	726	1456	0	1.410	1107	535	966	400	:	651	1077
Expansion 32 to		:	:	100 .	1000	.0051	:	:	.0035	1800.	800.	:	.0182	.0038	.0027	:	.0056	:	:	6900.	.0088
Conductivity of Electricity.	:	:	4.6	1:1	:	91.1	73.0	:	15.5	7.6		:	:	13.1	16.6		100.00	:	12.0	11.4	39 0
Conductivity of Heat	:	31.33	4 03	<u>*</u>	20.06	71.8	51.8	:	10.1	6 2	# # #	:	1.3	:	9.4	:	100.00	36.5	11.6	15.4	36.0
Specific Heat.		12.	8020.	8020	.0567	.09.3	+280.	9280	821	1180.	21. 21.	. I :	.0317	.109	1280.	.166	.056	292	. 1165	.055	960.
Melting Point F.		1160	<u>x</u>	510	500	1930	1915	4500	300	625	1200	3120	8	0008	9078	110	1750	170	2550	440	780
Weight Cable		159,005	418.402	612.513	536.253	519.971	1221,699	1392,999	186.369	708.976	89.791	498-81	816.781	551,812	155.887	51,561	656,598	60.503	489.736	151.751	411,215
Welght Cubic inch.		1260.	51 51	1354	13.1	818.	.697	808.	± 20 € 1	911	855	683	061.	318	777.	.0316	88.	.035	15 83 13 13 13 13 13 13 13 13 13 13 13 13 13	263	865
Specific Gravity,		2.55	6.71	9.823	œ.	x .x	19.32	22 . 42	x.	11.37	1.71	8.0	13.58	x. x	21.50	873	10.53	.9735	7.854	7.293	7 : 1
Atomic Weight.	-	27.3	122.0	207.5	111.6	63.3	196.3	196.7	55.9	206.4	23.92	58.8	8.661	58.6	196.7	39.04	107.66	23.0		117.8	6.19
.feltfal.	H.	AI.	Sb.	Bi.	Cd.	Cu.	Au.	<u>r</u> .	Fc.	Pb.	Mg.	Mn.	E S	ž.	1.t.	K.	Ag.	ri Z	:	Sn.	Zn.
Chemical Name.	Same	Same	Stibium	Ѕате	Same	Cuprum	Aurum	Same	Ferrum	Plumbum	Same	Same	Hydrargyrum.	Same	Same	Kalium	Argentum	Natrium		Stannum	Same
Common Name.	Hydrogen	Afuminum	Antimony	Bismuth	Cadmium	Copper	Gold	Indium	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Platinum	Potassium	Silver	Sodium	Steel	Tin	Zinc

LAW OF SPECIFIC HEAT—In order to raise the temperature of different bodies the same number of thermometric degrees very different amounts of hear The atoms of the solid element possess sensibly the same specific heat. are required.

DUCTILITY-The property of being drawn into wire or threads.

MALLEABILITY—The capacity of being extended in all directions by beating with the hammer.

Weights of Materials.
Dry; Woods.

	Dry <sub>2</sub> W	oods.
	os. Lbs.	Lbs. Lbs.
	rd ft. Cubic ft.	Board ft. Cubic ft.
* *	49.	Iron Wood 6. 71.
	3.9 47.	Larch 3. 35.
	3.9 45.	Lignum vitæ 6.9 83.
	3.7 43.	Mahogany, Honduras 2.9 35.
	. 60.	Mahogany, Spanish 4.4 53.
	2.9 35.	Maple 4.1 49.
•	3.9 47.	Maple, soft 3.5 42.
,	2.5 30.	Oak, live 4.9 59.3
Cherry 3	.5 42.	Oak, red 3.9 45.
	.4 41.	Oak, white 4.3 52.
	.3 15.	Pine, Southern 3.7 45.
Elm 2	.9 35.	Pine, white 2.1 25.
Ebony 6	.3   76.1	Pine, yellow 2.8 34.3
Hemlock 2	.1 25.	Spruce 2.1 25.
Hickory 4	.4 53.	Sycamore 3.1 37.
Hornbeam 2	2.9 47.	Walnut 3.2 38.
	Bullding Materi	ials Stacked
	Lbs. Cubic ft.	Lbs. Cubic ft
Brick, pressed		Granite or limestone, rubble work 138
Brick, common		Granite or limestone, well dressed 165
Cement, Portland		Limestones and marbles 168
Cement, Rosedale		Lime, quick
Common brickwork, cement i		Mortar, hardened
		Plaster of paris
Common brickwork, lime mor Concrete cement		Sand
		Sandstone
Earth dry, shaken		Shales
Earth, rammed		2
Glass, window		Slate
Granite	110	Trap rock
BUILDIN	G MATERIALS	IN CONSTRUCTION.
Roof Covering.	os, per sq. ft.	Joists and Rafters. Lbs. per sq. ft.
Shingles, wood, 16"		
Tin and paint		White pine, 2"x4", 16" o, c
Iron sheet black and paint		White pine, 2"x6", 16" o, c
Iron, galvanized		Y. P. 2"x6", 16" o, c3.75
		White rine 2"rs" 16" o. c. 200
Iron, corrugated		White pine, 2"x8", 16" o, c3.00 Y. P. 2"x8", 16" o, c5.0
Copper, sheet		1. f. 2 x8 , 10 0, c
Sheet Lead (See File 695)		White pine, 2"x10", 16" o, c3.75
Zine		Y. P. 2"x10", 16" o, c6.25
Ready Compo Roofing		Purlines,
Felt and gravel		
States, average (See File 695).	10.00	Wood, if supporting rafters1 to 3
Tiles, plain, average	12.00	Iron or Steel, if supporting rafters2 to 4
Tiles, fancy, laid in mortar	25 to 30.	Cailing
Sheathing, Flooring, Etc.		Ceiling.
		Wainscoting or D. M. & B. stuff, same as
Pine, Hemlock, Spruce, Popl		sheathing.
Redwood, per inch thick		Lath and plaster, 2 coats 9
Chestnut or Maple		Lath and plastering, 3 coats10
Ash, Hickory, L. L. Y. P., Oak.		Light book tiles, supported by T-bars
Brick arches, 4" thick & concre	te 70.	without plastering 5
Porous tiles for slating, with	out	•
slate	. 10.	Live Loads.
Hollow tiles, 3.75" flat	12.	See building code. Snow load for New
Hollow tiles, 6" arches		York City, Cleveland, Chicago, Des Moines,
Hollow tiles, 9" arches		averages about 20 lbs.
, , , , , , , , , , , , , , , , , , , ,	• • •	averages about 10 100.
Weigh	it per Square F	oot of Sheet Lead.
le inch thick	$\dots$ 2 lbs.	$\frac{1}{10}$ inch thick 7 lbs.
3 " " " 34		$\frac{1}{8}$ " 8 "
25		$\frac{1}{8}$ " 8 " 8 " 10 " 10 "
1		1 6 " · · · · · · · · · · · · · · · · · ·
14		$\frac{7}{32}$ " " … 14 "
12	6 "	½ ' ''16 ''

### PLANS, SPECIFICATIONS AND ESTIMATES. NOMENCLATURE OF DRAWINGS.

FILE 692

In response to a request sent out to a large number of prominent architects to send in copies of nomenclature used on their drawings, it was found that this varied with practically every architect, the result being that contractors estimating in different offices are compelled to memorize a large number of different systems of notation before being able to read plans intelligently; same rule applies to draughtsmen going from one office to another, all of which causes much waste of time and greatly increases the possibility of error. With this as an excuse we offer the following series of symbols, selected from the various systems with the hope that it will be generally adopted and thus bring about a greater uniformity of drawing nomenclature. The lighting symbols are taken from the standard symbols for wiring plans, prepared by the National Electrical Contractors Association of the United States. The structural iron symbols are taken from the Osborne system of nomenclature most generally used by structural iron contractors. General sym-

bols are collated from various sources.

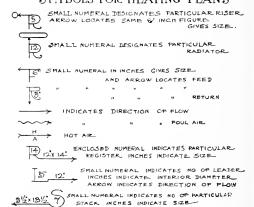
### · LIGHTING SYMBOLS ·



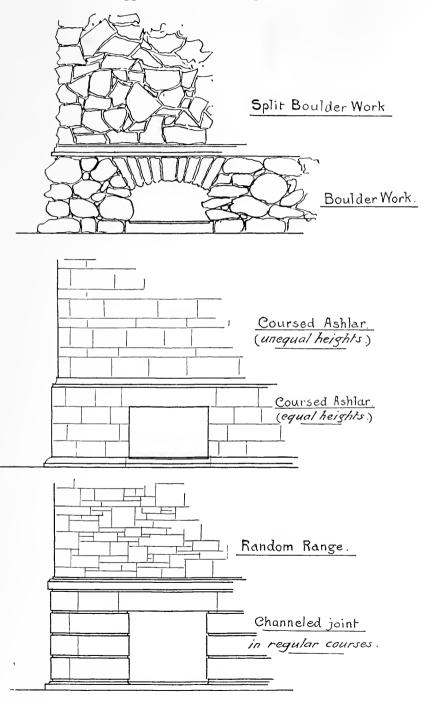
### 9'8'10' GIRDER; NUMERALS INDICATES SIZE. ENGLOSED NUMERAL IND. PARTICULAR GIRDER. SIZE COLUMN; SMALL NUMERAL INDICATES NUMBER OF DARTICULAR NUMBER OF PARTICULAR COLUMN DOOR; SMALL NUMERAL INDICATES 25) NUMBER OF PARTICULAR DOOR 50/ WINDOW, SMALL NUMERAL INDICATES NUMBER OF PARTICULAR WINDOW INDICATES DESIGNATING NUMBER OF ROOM ELEVATION OF POINT SMALL NUMERALS INDICATE. 17-6 DISTANCE ABOVE ZERO POINT IF PRECEDED BY - REFERS TO POINT BELOW ZERO. BRICK CONCRETE WALLS WITH WOOD FURRING & LATH & PLASTER " METAL " & PLASTER " TILE HOLLOW TILE CONSTRUCTIO! WALL OF WOOD STUDS & LATH & PLASTER STONE. RUBBLE RUBBLE STONE DIMENSION STONE ASHLAR STONE DEESSED ASHLAR ROCK FACED ASHLAR ANY STONE DRESSE,D NOT DESCRIBED SMALL NUMERALS REFER TO DETAILS & SPECIFICATIONS - STORM SEVER --- - prainage, System SANITARY SEVER

·GENER, AL SYMBOLS ·

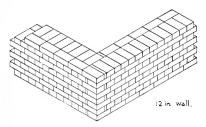
### ·SYMBOLS FOR HEATING PLANS ·

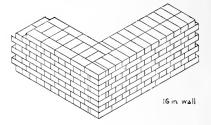


### Suggestions for Setting Stone.



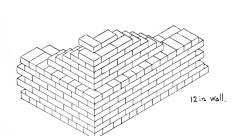
### Bonds Used in Laying Brickwork.

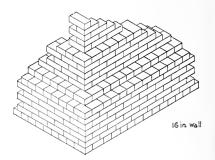




English Bond.

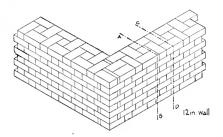
One row of headers and one of stretchers in alternate courses.

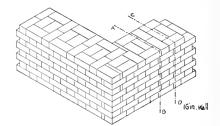




### Chicago Bond.

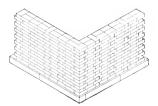
One row of headers and five courses of stretchers.





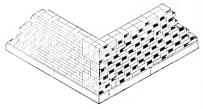
### Flemish Bond.

Headers and stretchers alternating in each course.



### English Garden Wall Bond.

Three stretchers and one header alternating in each course.



### German Cross Bond.

Two stretchers and one header alternating in each course.

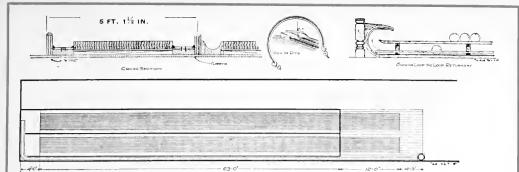
# · PROBLEMS ON THE ELLIPSE & PARABOLA. CВ 3 4 5 G

# TABLE OF TREADS AND RISES.

Rise.	c1	4	9	œ	10	0	Ç1	7	9	œ	10	0	ÇI	4	9	∞	10	0	ÇI	77	9	œ	10	0	¢1	4	9	œ	10	0
10ch	-	~	က	4	5	7	∞	6	2	Ξ		14	12	16	17	82		12	22	23	74	52		82	53	8	31	33		32
Rise.	-	C1	ಣ	4	5	9	-	oo	G	10	=	0	_	сı	ಣ	4	20	9	7	x	6	10	11	0	_	21	က	4	10	9
ich Rise. Inch R.	_	~	ო	4	2	စ	7	∞	6	2	Ξ	13	14	15	16	17	18	19	8	21	22	23	24	26	22	8	53	8	31	32
Rise		_		8	7	!	20	4		ÇI		0	11	10	6	œ	<b>!</b> ~	9	10	4	က	Ç1	-	0	Ξ	2	6	œ	-	9
ft.	\ 2	_	~	<u>س</u>	4		9	_		6		Ξ	11	12	22	17		16	17	18	19	8		22				25	58	
ch Rise, In		6		9	$4^{1/2}$	တ	11/2	0	$10^{1/2}$	6	71/2	9	41,2	က	11.	0	$10\frac{1}{2}$	ų	712	9	41/2	65	$1\frac{1}{2}$	0	$10^{1/2}$		$71_{2}^{\prime}$	9		8
田井二		_	2	<u>ო</u>	4,	, co	-	7	7	∞	6	2	=	12	13	14	14	15	16	17	18	19	ន	21	21	22	23	24	22	56
h Rise.	10				¢1	1	10			#	C1		10		9	4		0	10	∞		4			10				٠. دع	
e. Inch	· 61	_	.2	-	4		.01	_	· 61		6	2	2 10	=	2 12	13	2 14	55	· 15	16	2 17	18	2 16	8	22	22		×	24	22
h Rise.	9		2 41	23	Ξ	6		3.4	1,1	11	8 8	9	3	-	$10^{1}$	- ∞	10	3	0	01 9	7.1	2	23	0	íĈ	-	4,2	¢1	2 111/2	6
se Inch		_	-			4.		_					2	=	=	12	13	14	15	15	=	17	18	19	==	1			22	
Inch Rise.	6		2 3		ဇ	1	5 3	9		9 2	ണ ∞		6	10 6	1 3	1	12 9		14 3	15 0	15 9	16 6		18 0	18 9				21 9	
n. ft.	81,2		112		- 61		.0		41,2	_	. 61	_	2,2	_	2 11	1	- 61	_	~ c3	_	1 <01	_	\c1	_	.61	-	11/2		<b>\61</b>	_
ch Rise.			2	2 10	9	8	4 111	ις α		7 1	16 2		6	9 11	10 73	11 4	12 0	12 9	13 5	14 2	14 103	15 7	16 3	17 0	17 8	18 5		19 10	20 63	1 3
Rise, Inch in, ft.		412	77	-	514	11,2			÷		l			71,2	33, 1	-	81,1	41/2 1	03,1	_	51.1	11/2	93,7		***	1	63.1			71/2 2
Inch Ri			2	2 9		4		5 6	6 2	6 1012	7 634		8 111,		10 3	1 0			13 0	13 9	Į.	15 1	15 9	16 6	17 23	17 101/2		19 3	19 11%	20 7
p. ge		_	_		_	<u> </u>	_	_		_			_			=				_	_		_			1	_			-
Inch Rise. In f	œ		2	2 8	ა.	4	8	5	0 9	8	4 7	0 8	<b>8</b>	<b>₹</b> 6	10 0	10 %	11 4	12 0	12 8	13 4	14 0	14 8	15 4	0 9	1 <b>6</b> 8	17 4	18 0	18 8	19 4	200
Rise. In	7.7	33,	. 8	71.		1.1	718		18	634	25,8		63,	214			178 1	93.7	5.58	152 1	93,8	51,1	118 1	_	478 1	034 1	858 1		038 1	81,1
Inch Ru ft.	Ŀ-		1  115			3 1114	4	5 3	5 1078	9	2	7 101/2		6	9 1018	10 6		11 9		13	13	14 5	15 1	15 9	16 4	17 0		18 4		19 8
Rise. In	73,	312	1114		234	101/2		c1		2	114		13,		81,1		11%	712 1	31,1	_	634 1	212	101,1		137 1	1 /61		_	834	41/2 ]
ft.	[-	3	1 11	2 7		3 10	4-6		5	6 5	7 1	7 9	<b>7 8</b>		8	10			12 3	12 11	13 6	14 2	14 10	15 6	16 1	16 91			18 ×	19 4
Rise. Ir.	758	1,1	10.78	61 2	216	93,4	5.3		85.8	41.4	1 t-20	717	3 g	$10^{3}_{4}$	6.38	1	95%	51,1	073	. is	1 m	113,	738		1058	1 77		91.2	51.8	03,4
Inch R			1			1	4	5 1						8 10		10 2	10 9			12	13	13 11	14 7	15 3	15 10	9 91			18	
Rise. In	712	~	101	9	11.2	_ 	41/2	0	717		101,2	9	$1^{1/2}_{2}$	_	41,2	0	71/2	65	101,2		11.5		412	-0	717	63	101,2		112	6
Inch R		-		~		1		s S		9		2			6	2		11	11 10	12 6	E1	13	14 4	15 (	15	91	16 10	17 6		18
Rise. I	73%	234	101g	51.5	0 7 <sub>8</sub>	81,1	358		£.9	13,	976	41/2	1178	71.4	.88.	-	53,	03,	818	312	10 78-	1.9	15.8		4 3%	113,	71,8	21/2	978	514
Inch B		-	1		က	ຕ	4	4 11	s	13	9		7 11	∞ 	6	9 10		11		12	12 1	13	14	14	15	15 11		17	17	18
Rise. I	717	212	93,	20	$0^{1}$	71.2	23,	_	51,4	012	73,1	8	1014	$5^{1}_{2}$	0 34		31,4	101 2	53,		81,1	31.2	103,	9	11,1	81,2			614	112
Inch R			_		က	(m)	4	4 10	ស	9		<u>~</u>			6	6	10 8		11	12	12 %				15 ]	15		16 11	17	18
Rise. I	718	21.1	938	412	1158	63%	1.7 <sub>8</sub>	6	4 18	111,4	8.9	717	85.8	33,	1078	9	1,8	81.	338	101/2	558	03,	7.78	83	1018	51.5	8:0	71%	258	934
Inch F			-			1	4			5	ŀ			∞						=======================================	ŀ	13	13	14	14 1	15	16	16		17
	-	C1	6	4	=	9	_	<b>*</b>	8	10	20	0	<u>-</u>	c1	6	4	11	9	_	<b>%</b>	m	10	10	0	<u>-</u>	67	6	4	11	9
Inch 1		_	-	2	2 1	က	4	4	ro	5	9	2	2	<b>∞</b>	∞	6	9 1	2	Ξ	=	12	12 1	13	14	14	15	15	16	16 1	17
Rise.	634	$1^{1/2}$	81.4	65	Fc6	41/2	1114	9	034	71.2	212	6	33,	$10^{1}$ $^{2}$	51,4	0	634	11/2	81,1	9	93.	41,2	$111_4$	9	760	71,	214	G.	33,	1012
Inch ft.		-	-	82	87	က	3 1	4	2	2				7 1	∞	6			21	Ξ	Ξ		12 1	13	14	1	15	15	16	16 1
Rise.	$6^{1/2}$	_	212	G1	815	8	91/2	7	$10^{1}\frac{1}{2}$	2	1112	9	012		11,00	x	$2^{\frac{1}{2}}$	- -	$3\frac{1}{2}$	10	41/2	11	$5^{1/2}$	0	$6^{1/2}$	-	71,2	ÇI	81,2	es
ff.		_	_	2	8	က	က	4	4 1	2			2	2	œ	1			01	10	Ξ	11 1	12	13	23	4	14	15	15	15
Rise.	$61_4$	210	634	П	71.	11,2	73,	63	81	212	83,	83	$91_{3}$	31,2	93,	4	$10^{1}_{1}$	$4^{1/2}$	103,	10	11.1	515	113,	9	$0^{1}$	612	$0^{3}$	<u>-</u>	114	$7^{1/2}$
Inch ft.		-	-	2	2	63	က	4	4	2	2	9		2		∞			9 1	9	101			12	13	23	14	14	15	15
Rise.	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	9	9	c	9	0
Inch Rise, Inch Rise Inch Rise, Inch Rise, Inch Rise, ft. in. ft. in. ft. in. ft. in.		-	-	87	~	က	က	4	4	7.0	ro	9	9	2	7	00	∞	6	6	2	2	=	Ξ	12	12	13	13	14	14	15
Treads.	1	C)	ত্তে	4	13	10	~	æ	6	10	11	12	13	14	15	9	1	æ	6	20	-	ÇŞ	83	24	55	9	7	88	63	30

Subtract the WILE FOR CALCULATING PROPORTIONED WIDTH AND HEIGHT OF TREADS AND RISES OF STAIRS.

Subtract the WILE for a form 25 in. and the result will be twice the height of the riser. Thus: if the tread is 10 in. wide, then  $25 - 10 = 15 \div 2 = 7\%$  in, the height or riser proportionate to a 10-inch tread. This is exclusive of nosings.



Important Points in Figuring Dimensions of a Stable.

The proper height and width of a stable door is not less than nine feet square. Width and height of vehicles is as follows:

0	Heig	ght.	Length.	Wi	dth.
	Ft.	In.	Ft.	Ft.	In.
Brougham	7	0	11	6	0
Rockaway	7	0	11	6	0
Victoria	7	6	12	6	0
Phaeton	8	6	10	6	0
Berlin Coach	7	6	13	6	6
Landau	7	6	13	6	6
Body brake	9	0	11	7	0
Goddard phaeton	8	0	9	6	0
Stanhope	8	0	9	6	0
Buggy	9	0	9	6	0
Single trap	6	0	9	6	0
Mail coach	9	0	15	7	6
Omnibus	8	0	11	~	0

Horse Stalls.—Width, 3 feet 10 inches to 4 feet, or over 5 feet in width and 9 feet long. Width should not be between 4 and 5 feet, as in such cases the horse is liable to cast himself.

Spec. No.	No. of Stops.	From Back to Front Line of Case.	Width of Space Required.	Height Required for Swell-Box and Large Pipes.	Spec. No.	No. of Stops.	From Back to Front Line of Case.	Width of Space Required.	Height Required a for Swell-Box and Large Pipes,
5 7	10	7' 4"	11' 6"	12' 6"	20	21	12′ 9″	15' 6"	17'
7	11	8′	11' 6"	12' 6"	22	22	$13' \ 4''$	15' 6"	17'
8	12	8′	12' 6"	12' 6"	23	23	13' 6"	15' 6"	17'
10	13	S' 7"	12' 6"	12' 6"	25	$^{24}$	14'	15' 6"	17'
11	14	9′ 3″	12' 6"	12' 6"	26	25	14' 6"	15' 6"	17'
13	16	10′ 5″	12' 6"	12′ 6″ 12′ 6″ 17′	28	26	14' 6"	15' 6"	17'
14	17	11'	14' 8"	17'	29	27	14' 6"	16' 4"	17' 6"
16	18	11' 7"	14' 8"	17'	31	28	15'	16' 4"	17' 6"
17	19	12' 2"	14' 8"	17'	32	$\frac{20}{29}$	15' 6"	16' 4"	17' 6"
19	20	12' 9"	14' 8"	17'	34	30	15′ 6″	17'	17' 6"

Add 40" more from Front Line of Case for Keydesk Pedals and Seat.

### Sizes of Piano.

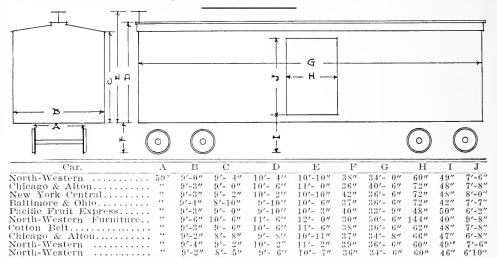
### 71% Octaves.

	Height.	Length.	Width.
Uprightabout	4 ft. 3 in.	5 ft. 4 in.	2 ft. 3 in.
Small or Baby Grandabout	3 ft. 2 in.	6 ft. 0 in.	4 ft. 10 in.
Parlor Grandabout	3 ft. 2 in.	7 ft. 6 in.	5 ft. 0 in.

### SIZES OF FREIGHT CARS.

In response to the numerous requests of architects that we give information as to car and track sizes, etc., essential to the proper planning of buildings where car service is required, we have taken measures of ice is required, a number of different cars and present below

diagram indicating dimensions of same which we hope to be sufficiently general to meet the architect's needs. It will be noted that there is a wide variation in the size of cars designed for various purposes and built by the different roads.



9'- 6"

Quoting from Bulletin No. 119, the American Engineering and Maintenance of Ways Association, issued in January, 1910, we find they recommend that the cross section of the control of the single track tunnels shall be 12' in width, in height from the top of ties to the spring of arch and the arch to have a radius of making the distance from top of ties to top of arch 20' and the ballast extend for a distance of 2' below the top of ties which they designate as sub-grade. Apparently this would indicate that it is undesirable to locate the walls or columns of a building closer than 8' from the center of a track, in order to prevent the crushing of a person

caught between the track and the walls. The committee reports under "Rules for Roundcommittee reports under "Rules for Round-house Construction" that turntables should not be less than 75' feet in length; that not be less than 'o' feet in length, man length of stalls for engines should not be less than 85' clear, in length; that the clear opening of entrance doors should not be less than 13' in width and 16' in height, which would indicate that straight tracks can be would indicate that straight tracks can be placed 13' from centers. Allowance, however, should be made for clearance of projection of car beyond trucks at curves. old rules permitted entrance doors to be reduced to 12' in width. Increased size in cars account for new recommendation.

34'- 6"

34'-10"

60"

46"

50"

6'10"

6'10"

36"

40"

10'-10"

### Size of Swimming Tank.

Swimming tanks that can be used for swimming contests must be exactly 20 yards in interior length, no more no less. (A tank 1/2 inch short would be ruled out of con-Eight yards wide is best, although 7 yards will pass; 4 feet deep at shallowest point and 8 feet deep at deepest point, which deepest point should be about 12 feet from end where springboard is placed. Depth at springboard end should be six feet. Interior of tank, both sides and bottom should be white, and there should be three black lines on the bottom extending parallel with sides, and dividing the tank into four equal alleys; there should be a line across tank on bottom and up sides at exactly 2 yards from each end, measured horizontally, making lines exactly 16 yards apart horizontally.

### Size of the Billiard Room, Gas Light, Etc.

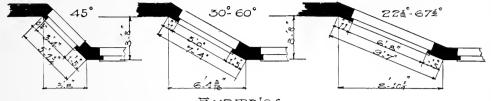
The space required for the different sized tables is as follows:

9'-6"

For table 6 x 12......Room should be 16 For table 5 x 10......Room should be 15 For table  $4\frac{1}{2}$  x 9......Room should be 14 x 17 

The following directions for arranging the lights over billiard tables will be found useful. The distance of the light from the floor should be about 6 feet 2 inches. For a 54 by 11 table, cross-arms 31 inches and long arms 62 inches. For a 5 by 10 table, the cross-arms of the pendant should measure, from light to light, 28 inches and the long arm 56 inches. For a 4½ by 9 table, cross-arms 25 inches and long arms 50 inches. For a 4 by 8 table, cross-arms 22 inches and long arms 44 inches.

# Table Showing the Length of Sides of Bays, Angle being 45, 30-60 and 22½-67½ Degrees.



## Examples.

#### Angle of 45 Degrees.

												1												
1	ft.	6	in.	by	1	ft.	6	in2	ft.		in.										in4		016	in.
1	6.6	7	4.6	64	1	6.6	7	" 2	6.6	2 7/8			2	66	11	"	4.4	2	66	11	" 4	4.4	1 1/2	6.6
i	44		44		ī	64	8		4.4	4 1/4	44			6.6	0		6.6		4.4				2 15	**
î	44		**		1	44	9		**	5 <del>  1</del>	44	1 3	3	"	1	"	4.6	3	6.6	1			4 15	44
ī	4.4	10	6.4	4.6	1	4.4	10	** 2	4.6	7 1/8	44		3		2		* *	3	6.6	2	" 4	4.6	5 %	64
1	4.4	11	4.4	6.6	1	4.6	11	"2	* *	8 1/2	4.6	1	3	4 4	3	6.6	4.4	3			" 4		$7\frac{1}{8}$	**
2	4 4	0	6.6	6.6	2	6.6	0	" 2	6.6	9 15	"		3	"	4		4.6				" 4		S 18	44
2	44	1	4.6	4.4	2	"	1	" 2	4.4	11 %	64	1 :	3	4 6	5	4.4					" 4		10	"
2	"	2		4.6	2	6.6		" 3		0.34	"		o .	4 6	- 6		6.6		6.4	6	" 4		$11\frac{3}{8}$	44
2	6.4	3	4.6	"	2	4.4	3	" 3	**	2 3	"		3		7	4.6	"	3		7	"5	44	$1_{16}^{5}$	"
2	4.6	4	44	4.6	2	6.6		" 3	**	3 %	64	:	3	66	-8	• •		3			" 5	64	2 1/4	**
2	4.6	5	4.4	"	2	4.4		" 3	"	5	44			64	9		* *	O			" 5		$3 \frac{5}{8}$	44
2	* 4	6	4 6	4.6	2	6.6	6	" 3	4.4	6 7	44				10		* *	3	"	10			$5 + \frac{1}{16}$	"
2	"	7	44	6.6	2	44		" 3		$7.7/_{8}$	**		o .	46	11	4.4	"	3	"	11	6		$6\frac{1}{2}$	44
2	4.6	8	4.6	**	2	6.6	8	" 3			64		1	4.4	0	44	4.6	4	**	0	" 5	**	$7.7_{8}$	44
2	4.4	9	4.6		2	6.4	9	"3	4.4	10 {}	**													

#### Angle of 30-60 Degrees.

### Angle of $22\frac{1}{2} = 67\frac{1}{2}$ Degrees.

1	ft.	- 6	in.	by	3	ft.	7 7	in	3	ft	11	in.	2	ft.	10	in.	bv	6	ft.	10 ₹	in	7 ft	. 4 13	in.
1	66		4.6			6.6		**				64	2	4.4				7			"	7 '	7 7	* *
1	14	S	4.4	4 6	4	4.4	0 5	"	4	4.4	4 15	6.6	3	4.4	0	4.4	6.6	7	4.6	2 15	**	7 "	1018	4.6
1	**	9	4.4	4.6	4	4.6	2 11	"			0 %	6.6	3	6.4	1	6.6	. 6	7	6 6	$5^{-5}_{16}$	"	8 "	$0^{\frac{11}{16}}$	4.4
1	6.6	10	4.6	6.6	4	"	5 1/8	"	4	"	9 1/2	4.4	3	4.4	2	6.6	4.4	7	6.6	7.87		8	3 15	4.6
1	66	11	6.6	**	4	4.6	7 1/2	"	5	4.4	0 1/8	64	3	4.6	3	6.6	6.6	7	6.4	10 1/8		8 "	5 1 5	
2	4.6	0	4.6	4.6	4	"	9 15	"	5		2 11	64	3	6+	-1		4 6	0	4.6	0 %	"	8 "	8 1/2	44
2	6.6	1	4.4		5	"	03%	"		4.4	5 3/8	14	3	"	- 5	6.4	**	S		3	"		1113	44
2	**	2	4.4	4.4	5	"	2 34	"	5	4.6	7 15	"	3	6.6	- 6	6.6	6.6		4.6	$5.3'_{8}$		9 '	1 34	"
2	"	3	4 6	**	5	"	5 3	**	5		10 16	**	- 3	+4	7	. 6	4.6	S	+ 6	7 13	"	9 "	$4.3_{8}$	**
2		4	44	4 4	5	4.6	7 5/8	"	6		$1_{16}^{3}$	6.4	- 3	4.6	S	4.6	6 +		4.4	1014	"	9 '	7	"
2	4.4	- 5	61	4.4	5	"	10	"	6	4.6	3 34	14	3	66	- 9	4.4	4.6	9	4.6	0.5%	"	9 '	9 18	"
2		6			6	"	0 7	···	6	•••	6 3%	44	3	6.6	10	4.4	64	9	. 6	3 18		()	. 0 tg	4.6
2	4.6	7	+ 4	* *	6		2 13		6	4.4	9	4.6	3	4.6	11	6.6	4.6	9	+ 4	5 7	"	0 '	2 13	6.6
2		S	4.4		6	"	$5\frac{1}{4}$	"	6	٠	11 %	"	4	4.6	0	6.6	4.4	9	4.4	9.7%	**	10 '	5 7g	6+
2	"	9	64	44	6	**	7 11	"	7	4.6	2 1/4	4.6												
													1											

#### ESTIMATE DATA

ESTIMATE BY CUBE

In April, this year, thirty-three letters were addressed to prominent architects of this city asking the below quoted questions These letters were sent out for the purpose of determining whether there existed any uniform practice as to methods of measurement for determining while contents of measurement for determining only contents in the contents of the contents ment for determining cubic contents in cases where estimates are made on cubic basis. We give below tabulation of replies received, the numbers above columns corre-

ceived, the numbers above columns corresponding to the numbers of paragraphs answered in said columns, and the numbers at the side of tabulation giving the designating number of the architect's reply. The nam of the architects replying are withheld agreed. It is sufficient to say that t The names thirty-three architects sent to are probably the architects for more than 50 per cent of the entire value of all buildings erected in Chicago during the last year. Dashes are placed opposite questions not answered:

In figuring the cubic contents of buildings to be used in preparing approximate estimates of the cost of same, do you estimate

the height from

1, the bottom of spread foundations or footings to the average height of roof;

2, the underside of basement floor to average height of roof;

of spread 3, one-half the average depth footings to the mean height of roof: 4, the top of basement floor to the top of

constructed with sprinkler system? 12, What do you consider from your experience, using your method of figuring, to be the approximate cost per cubic foot of the average fireproof commercial Loft Building, on a corner lot having 75-foot frontage or more on front street and the full depth of lot on the side street?

13, Same conditions as above except constructed with sprinkler system?

14, What do you consider from your experience, using your method of figuring, to be the approximate cost per cubic foot of the average fireproof commercial De-partment Store Building, eight stories or more in height, not less than 100-foot frontage on front street and full depth 100-foot of lot on side street, the average floor loads 150 pounds to the square foot and with the average floor loads 250 pounds to the square foot?

15, What do you consider from your experience, using your method of figuring, to be the approximate cost per cubic foot of the average commercial Apartment Building, where the apartments rent at

a rate of

19, \$ 6.00 per room? 20, \$ 5.00 per room? 21, \$ 4.00 per room? 16, \$15.00 per room? 17, \$10.00 per room? 7, \$10.00 per room? 20, \$ 5.00 per room? 3, \$ 8.00 per room? 21, \$ 4.00 per room? Where the term "commercial" is used in

the above questions it is understood to mean that the building contemplated shall be appropriate to the uses described and suitable

	1001	- ,									морг		10	1110	unca	<i>.</i>	0011	Jeu	CI II CI	- Cui	table
Arch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1				yes		ž ht.	yes	no	-	13to 15¢ tormer 119		-	-	-	_	2016 224	174	1629	-	-	
2	Pro	111150	d to	rep	ly la	ter															
3	yes					ŧ ht.	yes	no	35	_	_	12416	104	-		254	204	184	_	_	-
4		yes				exact	17	,,		_		-	_	25 to 35 %	_	_	-		_	_	-
5			yes			žht	11	12	35 10	8/2 to	Bto	151620	1210	_	_	_		_	_	-	
6				yes		11	"	11	30 to	10 \$0	10 to	10 10	1010	204 up	214	_	-	-	-	-	-
7	yes					31	>>	"	26 to	124	104	144	124	154		_	_			-	
8				yes		3 ht.	"	"	30 to	124	10½÷	1310	1010	-		_	_	_	_	_	-
9	Ref	โเรย	1 10	an	5we	r ".	It w	ould	do no	good	,										
10					yes	±ht.	yes	าาจ	25 TO 30 F		9 to	1310	-	-		-	_	-	_		
11					yes		,,	11	28 to	124	9 to	10 1/2 to	9 10	1516 184	210	18 % 20 ¢	17 to	16to 174	15%	134	114
12				yes			17	"	_	_		_	_	_	-	-	_	_ ]	_	_	_
	2	1	1	4	2		10		31.76	11.55	9.85	15.13	11.35	21岁	21/3	21	18	16.87	15½	13	11.

5, the bottom of spread foundations to the

5, the bottom of spread foundations to the top of parapet wall.
6, In the case of pitched roof building do you measure to one-half the height of pitched roof; or to two-thirds the height of pitched roof; or to one-fourth the height of pitched roof?
7, In the case of buildings having caison foundations do you figure only contents.

foundations do you figure cubic contents from the top of caisson foundation and estimate the value of caisson foundation independently?

8, Or do you figure a certain per cent of

the supposed height of caisson founda-tion as added to the height of building? What do you consider from your experience, using your method of figuring, to the approximate cost per cubic of the average commercial fireproof Office Building, twelve stories or over in height

Building, twelve stories or over in height on caisson foundation with an ordinary face brick exterior and limited amount of terra cotta trimming?

10, What do you consider from your expe-rience, using your method of figuring, to be the approximate cost per cubic foot for the average fireproof commercial Storage Warehouse intended for the storage of household furniture, etc.? 11, Same conditions as above, except Mill commercial

to bring the rents contemplated. It is not intended to include in these approximations the monumental or special building, but it is intended that where rents are indicated as high that the finish, construction and arrangement shall give the value usually given for the rent named, assuming that the lot is appropriate to the improvement.

We were greatly disappointed at the meager response to the letters sent out, but realize with what difficulty busy men find time to attend to extraneous work. The replies received are sufficiently representative and comprehensive to clearly indicate the wide variation of method of measuring height in estimating by cube.

The answers make clear that if the different architects represented in same called on to estimate the cost per cubic foot of a certain building, with a known total cost, their unit prices per cubic foot would necessarily vary because of the variation in volume produced by diversity in methods of estimating height of building.

To state that . . ilding costs more per cubic foot than an without stating that the volume has gured in the same way by the same man is likely to create a false impression.

## MASONRY, PLASTERING AND FIREPROOFING.

#### WEIGHT OF BRICKWORK.

Placing the weight of brickwork at 112 lb. per cubic foot, the weights per superficial foot for different walls are:

9 inch wall	84 lb.
13 inch wall	121 lb.
18 inch wall	168 lb.
22 inch wall	205 lb.
26 inch wall	243 lb.

#### MEASUREMENT OF OLD BRICK.

Uncleaned rough from building dumped from 8 to 10 bricks per cubic foot, or average of 111 cubic feet to the M.

Uncleaned stacked on outside and interior of stack filled promiscuously 10-12 per

cubic feet, or average of 91 cubic feet to the M.

Cleaned and closely stacked, 16 to 18 bricks per cubic foot, or actual average of 59 cubic foot to M. (Usually sold at 60 cubic feet to M to allow for waste and poor piling.)

Cleaned stacked on outside and interior filled promiscuously, 12 to 14 per cubic foot, or actual average of 77 cubic feet to M. (When sold from pile measure customary to count 80 cubic feet to M, to allow for waste and bats.)

#### Measurement of New Brick Work.

The Chicago Masons and Builders' Association have arbitrarily assumed that a cubic foot of wall contains 22½ common brick, or 7½ brick to the superficial foot of 4-inch wall and 15 brick to the superficial foot of 8-inch wall. These figures of the Mason's and Builders' Association are frequently used for the appraisal of party walls, etc., but if so used, the price per M for work in wall should be reduced accordingly.

The actual number of Chicago common brick required for a cubic foot of solid wall varies from 17½ to 19½, and masons in purchasing brick usually reserve 18 brick per cubic foot of solid wall, and when so doing, rarely find an excess or shortage at the end of construction. When the walls are divided into many small piers, requiring much cutting, and consequently much waste, it is best to figure 20 brick to the cubic foot.

On account of the wide variance of practice on the part of masons in estimating, architects, when calling for estimates on brick work by the thousand, will avoid useless controversy by stipulating that quantity of brick will be determined by superficial wall measurement according to the following rule, which is very nearly correct, as Chicago brick now run. Divide the total number of superficial feet of wall surface of a given thickness by 160, and multiply the result by the number of brick widths the wall is thick, and the result will equal the number of thousands of brick contained. A four-inch wall will contain 6% brick to the superficial foot, or 1,000 brick to 160 square feet.

#### Miscellaneous Masonry Data.

A fireproof floor constructed of iron beams and four-inch brick arches will weigh from 65 to 75 pounds per superficial foot.

The safe and proper bearing of joist, timber and girders supporting a floor should

not exceed ten tons on brick walls and fourteen tons on good stone walls.

A fireproof floor constructed of iron beams and of iron arches made of No. 18 iron, and filled in on top with concrete or slag and cement, will weigh about the same as brickwork four inches thick.

Lath and plastering, two-coat work, weighs from 9 to 12 pounds per superficial foot.

One hundred yards of plastering will require fourteen hundred laths, four and a half bushels of lime, four-fifths of a load of sand, nine pounds of hair and five pounds of nails, for two-coat work.

A load of mortar measures a cubic yard, requires a cubic yard of sand and nine

bushels of lime, and will fill thirty hods.

A bricklayer's hod measuring one foot four inches by nine inches, equals 1,296 cubic inches in capacity, and contains twenty bricks.

A single load of sand or other materials equals a cubic yard,

## FRAMED AND BOXED CONSTRUCTION CARPENTRY, STRUCTURAL AND ORNAMENTAL IRON.

## ESTIMATE DATA FOR ORDINARY STUD AND JOIST CONSTRUCTION.

By EMERY STANFORD HALL, B S.

No hard and fast rule can be laid down for estimating. There are so many practical exigencies which alter assumed or average conditions that experience and judicial capacity are essential to successful estimating. pacity are essential to successful estimating. Manifestly a well organized force commanded by men of executive ability can accomplish more and better work in less time and with less waste than a poor organization of inefficient men under incapable direction. Likewise work easily accessible and simple in design can be executed by any force with less waste and in less time than complicated work or work executed at a high altitude, requiring much scaffolding and hoisting apparatus.

FLOOR FRAMING.

The number of joists required is always in excess of the number which would naturally be called for by uniform spacing as indicated in Fig. 1 "Floor Construction, type C." Extra joists have to be put in to form trimmers and headers around chimneys, stair-wells, and other openings in floors. Also, joists should be doubled under partitions with block separators between so as to permit pipes passing through without cut-ting. These conditions, as illustrated below in Fig. 1, "Type E Floor Construction." show a case where 14 joists are required in only ten uniform spacings, which is extreme but taking an average of type "E" and type "C," conditions which occur with about equal frequency in buildings of average requirements. it is reasonable to assume that two extra joists will be required for every ten feet.

Number of thousands of board feet in joists for any uniform bent of any building, with any length of joists, when width of bent plus the joist bearing on walls or girders = 1; any stretch or depth of the bent parallel to joist bearings=1; any uniform distance between centers of joists = s; and J=

the result:—J = 
$$\frac{bd1}{12} \left( \frac{2L}{10} + \frac{L}{s} \right) = \frac{bd1}{12}$$
 — the

number of board feet of material in a piece of timber (b) thick by (d) in depth and (1) in length, and the values of same for material most generally used are given in table A.

Let  $\frac{b d l}{12}$  -B.

1 -10 L- -10

(1.) 
$$J = \frac{B}{1000} \left( \frac{2L}{10} + \frac{L}{s} \right)$$
. s is commonly equal

either to 1 ft. or 1% ft. Substituting 1 for value of s=joists placed 12'' from C.

(2.) J=.0012 L B. Substituting 11/3 for value of s = joints placed 16" from C.

(3.) J = .00095 L B.

(4.) J = .0008 L B.

To find the average amount of material contained in a square of 100 sq. ft. floor construction take a value of B corresponding to l=10, and a value of L=10 and substitute in either formula (1.), (2.) or (3.) according to spacing desired. The following "Table I" gives the result of such substitution for some of the more commonly used sizes of joists:

#### TABLE I. Number of M's of bd. ft. in a square of Ioo sq. ft. for various

		jo	ists in constr	nction
b d	$\frac{\frac{10 \text{ b}}{12}}{12}$ B	$J^{-\mathfrak{s}-1}$	$J^{-s-1}$	$J^{-s-1\frac{2}{3}}$
2 x 2	3.34	.01008	.031730	.06720
$2 \times 4$	6.67	.08004	.063365	.05336
2 x 6	10 00	.12000	.095000	.08000

Number : f W's of bd. ft. in a 1 10 square of  $100 \, \mathrm{sq}$ , ft. for various L = 10joists in construction.

b d	$\frac{10~\mathrm{b}~\mathrm{d}}{12} = B$	J s=1	$J^{s=1,3}$	$J^{-\mathfrak{s}=1\frac{9}{73}}$
2 x 8	13.34	.16008	.126730	.10672
$2 \times 10$	16.67	.20004	.158365	.13336
$2 \times 12$	20.00	.24000	.190000	.16000
$2 \times 14$	23.34	.28008	.221730	.18672
$2 \times 16$	26.67	.32004	.253365	.21336
3 x 6	15,00	.18000	.142500	.12000
$3 \times 8$	20.00	.24000	.190000	.16000
$3 \times 10$	25.60	.30000	.237500	.20000
$3 \times 12$	30.00	.36000	,285000	.24000
$3 \times 14$	35.00	.42000	.332500	.28000
$3 \times 16$	40.00	.48000	.380000	.32000
$4 \times 4$	13.34	.16008	.126730	.10672
4 x 6	20.00	.24000	.190000	.16000
4 x 8	26.67	.32004	.233365	.21336
$4 \times 10$	33.34	.40008	.316730	.26672
$4 \times 12$	40.00	.48000	.380000	.32000
$4 \times 14$	46.67	.56004	.443365	.37336
$4 \times 16$	53.34	.64008	.506730	.42672
COL. I	COL. H	COL. III	COL. IV	COL. V

Col. I gives size of joists or sticks of timber. Col. II gives the number of board feet in a stick of the size given in Col. I and 10 in a stick of the size given in Col. I and 10 ft. long. Col. III gives the amount of M of bd, ft, of framing material contained in a square of 100 sq. ft. for joists of the size given in Col. I when these joists are placed 12" from centers; Col. IV when placed 16" from centers; Col. V when placed 20" from

Bridging where placed 8 ft. on centers requires 12 pairs to the square where joists are placed 12" from centers; 9% pair where joists are placed 16" from centers.

PARTITION CONSTRUCTION.

The amount of material and labor involved in the various types of ordinary stud partitions is practically uniform for a given height of partition, spacing of studs and size of same. See types "F" and "G" in Illustration below. Type "F" has two layer bottom plate or shoe, I line of block-bridging and a single layer top-plate, while type "G" has two laver bottom-plate or shoe and two layer cap-plate with no block-bridging, giving the same actual amount of material. partitions are usually spaced out and studs set on uniform spacing, regardless of openings; then the openings are cut and studs around same doubled, requiring extra studs, as the posts at sides of openings rarely happen to fall on the line with study originally placed. Door opening Fig. 1, type "A" is usual condition. Door opening Fig. 1. is usual condition. Door opening Fig. 1, type "B," where both posts fall in line with studs as first set, is a type which almost never occurs in actual practice and so cannot be considered as a possible saving on material. "Section AA," Fig. 1, shows con-necting partitions from various directions and makes clear the necessity for extra studs above the number required for regusting above the number required for fegu-lar spacing to provide for angles. It will be seen that every angle requires from 2 to 4 extra studs. The pieces of studs cut out for openings are used for doubling, but there are not sufficient to supply all extra studding needed.

Number of thousands of board feet in studs for any partition with any length of studs, when length of studs between shoe and capplate = h; any length of partition measured in the horizontal direction and through all angles, so as to increase the actual length of partition by the thickness of same at angles = L; any uniform distance between centers of studs = s; and Q = the result: Observing Fig. 1, it will be seen that aver-

 $(\frac{L}{s}+\frac{8L}{10})_{h+4L}$ ft, ft age value of O = 12 14 1000

the number of board feet of material in a piece of timber or stud; (f) face by (t) thickness and one ft in length and the values of same for sizes of material most generally

used are given in Table II, Col. II. Let  $\frac{ft}{12}$  = F.

(5.) 
$$Q = F \left[ \frac{\binom{L+8L}{s+10}h+4L}{1000} \right]$$
. s is com-

monly equal either to 1 or 1½, sometimes 1½.
Substituting 1' for value of s=studs place 1 12" from C.

(6.)  $Q = \left(\frac{1.8Lh + 4L}{1000}\right)F$ .

#### TABLE II.

Size of studs	L=-10	12' spacing	16" spacing	20 <sup>//</sup> spacing
fxt	$_{_{12}}^{^{1t}}$ F	$Q_{h=10^\prime}^{s=1}$	$Q_{h=10}^{s=\frac{113'}{3'}}$	$Q_{h-10'}^{s=1^{\frac{9}{3}'}}$
1"x 1"	.084	.01848	,016380	.01512
$1 \times 2$	.167	.03674	.03240	.30060
$2 \times 2$	.334	.07348	.06480	.06012
2 x 3	.500	.11000	.09750	.09000
2 x 4	.667	.14674	.11027	.12006
$2 \times 6$	1.000	.22000	.19500	.18000
2 x 8	1.334	.29348	.26013	.24012
3 x 4	1.000	.22000	.19500	.18000
3 x 6	1.500	.33000	.29250	.27000
3 x 8	2.000	.44000	.38000	.36000
4 x 4	1.334	.30448	.26013	.24012
4 x 6	2.000	.440000	.39000	.36000
4 x 8	2.667	.58675	.52007	.48006
COL. I	COL. 11	COL. HI	COL. IV	COL. V

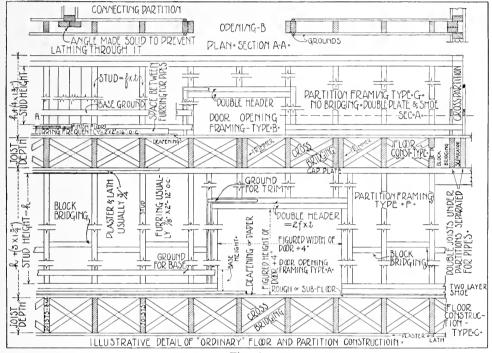


Fig. 1.

Substituting 11/3' for value of s=studs spaced 16" from c.

 $\left(\frac{1.55Lh+4L}{1000}\right)$ F. (7.)

Substituting  $1\frac{6}{3}$  for value of s = studsspaced 20" from c.

 $\left(\frac{1.4\text{Lh}+4\text{L}}{1.000}\right)\text{F}.$ (8.)1000

To find the average number of M's of bd. ft. of framing material contained in a square of 100 sq. ft. of partition construction take a value of F corresponding to size of studs used (see Col. II, Table II below) and a value of L=10 and substitute in either formula (5.), (6.), (7.) or (8.), according to spacing desired. This really will give a partition three or four × f greater in one dimension than 10 ft., but this should be allowed extra for places where the material will not cut to advantage. The following Table II gives the result of such substitution for some of the more commonly used tion for some of the more commonly used sizes of joists. (6.) becomes  $Q = .22 \,\mathrm{F}$ ; (7.) becomes  $Q = .195 \,\mathrm{F}$ ; (8.) becomes  $Q = .18 \,\mathrm{F}$ .

Col. I gives sizes of studs or furring strips. Col. II gives the number of board feet in a stick of the size given in Col. I and one ft. long. Col. III gives the number of M's of bd. ft. of framing material contained in a square of 100 sq. ft. of stud partition or furring, including extras and waste if constructed of studs of the size indicated in Col. I and spaced 12" from centers; Col. IV, spaced 16" from centers; Col. V, spaced 20" from centers.

**Grounds** are usually placed for nailing base-boards, dado-caps, and trim around openings. These are sometimes made  $1" \times 1"$  and sometimes  $1" \times 2"$  and are put up on both sides of partitions.

Number of thousands of board feet in grounds for a partition of any length and  $\label{eq:G} \text{height} = \text{G} = \ \Big(\frac{4\text{L} + 5\text{hO}}{100\text{m}}\Big).$ F when O = the number of openings and can be assumed to average L :

(9.)  $G = \left(\frac{4L + .5Lh}{1000}\right) F$ .

For one square L=10, h=10, then G=9 F. Value of F can be substituted from 09 F. Table II, Col. II. For 1"x1"

For 1"x1" grounds (1"x2" G=.01503 M bd. ft. G = .00756 M; for

#### EXTERIOR WALL CONSTRUCTION.

Frame exterior wall construction is so simllar to interior stud partition construction that for purposes of estimating quantity of material to determine cost Table II may be

used for estimating this work.

Furring is applied to exterior masonry walls, usually 1"x2" spaced either 12" or 16" from centers; similar furring is sometimes applied to the under side of joists to receive lath and also on top of rough floors to afford space for pipes; but here it is frequently 2" x 2". Not as much extra furring is actually put into the building as extra studs estimated in Table II, but there is so much waste of this material that amounts given in Table II should be used in estimating.

Coverings of Partitions, Walls, Floors and Cellings are measured by the surface area of each layer. Most such material is either lapped, matched or otherwise cut to waste, so that the surface area purchased will not cover the same amount of frame surface. cover the same amount of frame surface. This varies with different materials and the following table gives values of the factor W. bv which the actual measurement of surfaces must be multiplied to determine the amount of material which must be pursur-

chased.

#### TABLE III.

W=1 for plain boards laid close. W=.65 for 1" x 4" battens placed 6" from c. W=.75 for 1" x 6" battens placed 8" from c. W=1.13 for 6" to 8" D. and M. flooring or sheathing.

W=1.19 for 4" D. and M. flooring or ceiling.
W=1.25 for 3" D. and M. flooring or ceiling.
W=1.34 for 2" D. and M. flooring.
W=1.75 for 1½" D. and M. flooring.
W=1.30 for 6" siding 414 to weather.
W=1.38 for 4" siding 214 to weather.

For most felts and papers as these are usually listed for enough less W = 1.

than the roll actually contains to allow for lapping.

#### LABOR.

Wages for labor are paid by the hour and are governed by union scales. Let how wage = H = 65c in Chicago at this time. Let hourly

Labor required to place and finish material is usually approximated either by the time required to erect a square of surface of framing for partitions, walls, floors, or of layers of covering, or by the time required to place one M bd. ft. of material or M sq. ft. of surface in the case of sheet coverings. The latter method is the more practical and involves less work in estimatas these quantities have to be determined in estimating the material.

The following table gives the approximate number of hours it will take an average meto place one thousand (M) board feet face feet of material of the various or surface sorts and for various purposes enumerated.

#### TABLE IV.

Framing Stuff. Hours required to place 1 M. 2"x 3" studs require 35 hours to place 1 M. 2"x 4" and 2"x 6" studs require 32 hours to

place 1 M. 2"x x8" studs require 30 hours to place 1 M. 1"x1" grounds require 83 hours to place 1 M. 1"x2" grounds and furring require 64 hours to place 1 M.  $2'' \times 2'''$  grounds and furring require 50 hours

to place 1 M.

1" x 8" to 10" sheathing require 30 hours to place 1 M. 1"x4" roof sheathing or slats require 26

hours to place 1 M. 1" x 6" roof sheathing

roof sheathing or slats require 26

hours to place 1 M. Shingles laid 41/2" to W. require 5.8 hours to place 1 M.

1000 sq. ft. paper or felt require ¾ hours to place 1 M. 1"x8" and 1"x6" D. & M. sheathing require

25 hours to place 1 M.
1"x 4" D. & M. sheathing require 1"x 4" D. & M. sheathing require 26 hours to place 1 M.
2"x 4" and 2"x 6" D.

x 4" and 2" x 6" D. & M. sheathing require 20 hours to place 1 M.

3" x 4" D. & M. sheathing require 14 hours to

3" x 4" D. & M. sheathing require 14 hours to place 1 M.
3" x 6", 3" x 8", 4" x 4" and 4" x 6" D. & M. sheathing require 16.6 hours to place 1 M.
4" x 8" D. & M. sheathing require 15 hours to place 1 M.
1" x 1\\[ \frac{1}{2}" and 1" x 2" D. & M. hardwood floor-

ing require 66 hours to place 1 M. 1" x 3" D. & M. hardwood flooring require 58

hours to place 1 M. 1" x 4" D. & M. hardwood flooring require

1 1/4 " x 2"

53 hours to place 1 M.
½"x 2" D. & M. hardwood flooring require
63 hours to place 1 M.
½"x 3" D. & M. hardwood flooring require 114" x 3"

60 hours to place 1 M.
2" x 4" and 2" x 6" rafters require 33 hours to place 1 M. bd. ft.

x 8" rafters require 30 hours to place 1 M. bd. ft.

 $2'' \times 6''$  and  $2'' \times 8''$  joists require 25 hours to place 1 M, bd. ft. 2" x 10" joists require 21.5 hours to place 1 M.

bd. ft. 2"x12" and 2"x14" joists require 20 hours to place 1 M. bd. ft. 3"x8" and 3"x10" joists require 20 hours to

place 1 M. bd. ft. 3" x 12", 3" x 14" and 3" x 16" joists require 18

hours to place 1 M. bd. ft. 4" x 8" and 4" x 10" joists require 18

place 1 M. hd. ft.  $4" \times 12"$  and  $4" \times 14"$  joists require 18.7 hours to place 1 M. bd. ft.

4" x 16" joists require 16.7 hours to place 1
M. bd. ft. x 6" joists require 20 hours to place 1 M.

bd. ft. 6" x 8" and 6" x 10" joists require 18.7 hours to place 1 M. bd. ft. 6" x 12" and all stuff up to 16" x 16" for joists

require 16.7 hours to place 1 M.
"x 4" posts require 23 hours to place 1 M. bd. ft. x 6"

posts require 20 hours to place 1 M. bd. ft. S" x 8"

posts require 18 hours to place 1 M. bd. ft.

12" x 12". 14" x 14" and 16" x 16" posts require 16.7 hours to place 1 M. bd. ft.

#### TRIM OR FINISH.

It is impossible to give any accurate idea of the amount of time required to do this class of work, there are so many conditions that enter into consideration that can not be stipulated in a table.

Openings require in labor to put in blocks, set jambs or frames, place trim, hang doors or windows and put on hardware from 6 to 12 hours, but average in all sorts of work and buildings about 9 hours.

Baseboard, one member, 1000 lin. ft. requires 50 hours to place.

Baseboard, two member, 1000 lin. ft. requires 66 hours to place.

Baseboard, three member, 1000 lin. ft. requires 83 hours to place.

Plate-shelf, 3 part, consisting of shelf, apron and mould, 1000 lin. ft. requires 100 hours to place; add 1-6 hour for each bracket.

Wainscoting, plain beaded D. & M., requires

23 hours to place 1 M. bd. ft.

Paneled Wainscoting from 2' to 4' 6" high

requires about 83 hours to place 1000 lin. ft. Picture Moulding requires about 33 hours to place 1000 lin. ft.

Ceiling Beams, consisting of blocks, 3 sides and 2 to 4 mouldings, require about 250 hours to place 1000 lin. ft.

Seat with back and sides requires about 8

hours to place.

#### THE ESTIMATE.

The estimate at best can be little more than an intelligent guess based on past experience. One can never be sure that the same conditions will prevail in the job to be executed as have prevailed in the one just completed. No attempt has been made to

be executed as have prevailed in the one just completed. No attempt has been made to suggest a method of estimating cost of interior trim or exterior cornice frames, etc.

Estimated Cost of Rough Work, Floors and Roofs = [(J taken from Table 1 × N, taken from Table 1 V × union wages per hour, taken from union scale governing in the locality)

+ J × (price per M of material, obtained

from material dealer at the time of making estimate) + (the following for each layer  $\binom{100W_{\bullet}}{1000}$  taken from Table III of covering)

 $\times$  price per M of material)  $+\left(\frac{100\text{W}}{1000}\times\text{N}\times\text{H}\right)$ times the number of squares of this sort

of construction contained in the building. Estimate for partition work, proceed in same manner as for floor, only substitute from proper table.

Example—Estimate the cost of a 2"x4" stud partition 11 ft, high and 137 ft, long broken around various rooms and having studs placed 16" from centers and 1"x1" grounds.

Area = 137  $\times$  11 = 1507 sq. ft. = 15.07 squares. Q = .11027 from Table II, Col. IV, Dealer's price per M = \$25.00, N 2" x 4" studes from Table IV=.5 hr. H = \$60. G from formulae (9.) = .00756 and N from Table IV=2 hr.; then [(.11027  $\times$  \$25.00) + (.00756  $\times$  \$2.00) + (.1027  $\times$  \$26.00) + (.1027  $\times$  5  $\times$  \$0.60) + (.00756  $\times$  2  $\times$  \$0.60)] 15.07 =

#### STANDARD MEASUREMENT TABLE FOR TIMBER. FILE 694 0

_			_	-	_		_		_			_		_		_			_	_		_					1	T
FEMILIA	2×4	1×8	2×8	2×10	2×12	2×14	3×4	3×8	3×8	3×10	3×12	3×14	4×4	4×8	4×8	4×10	4×12	6×6	8×8	⊢	8×12	8×8	_	_		⊢	10×14	-
6	4	6	8	10	12	14	6	9	12	15	18	21	8	12	16	20	24	18	24	30	36	32	40	48			70	1
8	5	8	11	13	16	19	8	12	16	20	24	28	11	16	21	27	32	24	32	40	48	43	53	64	67	80	93	96
10	7	10	13	17	20	23	10	15	20	25	30	35	13	20	27	33	40	30	40	50	60	53	67	80	83	100	117	120
12	8	12	16	20	24	28	12	18	24	30	36	42	16	24	32	40	48	36	48	60	72	64	80	96	100	120	140	144
14	9	14	19	23	28	33	14	21	28	35	42	49	19	28	37	47	56	42	56	70	84	75	93	112	117	140	163	168
16	11	16	21	27	32	37	16	24	32	40	48	56	21	32	43	53	64	48	64	80	96	85	107	128	133	160	187	192
18	12	18	24	30	36	42	18	27	36	45	54	63	24	36	48	60	72	54	72	90	108	96	120	144	150	180	210	216
20	13	20	27	33	40	47	20	30	40	50	60	70	27	40	53	67	80	60	80	100	120	107	133	160	167	200	233	240
22	15	22	29	37	44	51	22	33	44	55	66	77	29	44	59	73	88	66	88	110	132	117	147	176	183	220	257	264
24	16	24	32	40	48	56	24	36	48	60	72	84	32	48	64	80	96	72	96	120	144	128	160	192	200	240	280	288
26	17	26	35	43	52	61	26	39	52	65	78	91	35	52	69	87	104	78	104	130	156	139	173	208	217	260	303	312
28	19	28	37	47	56	65	28	42	56	70	84	98	37	56	75	93	112	84	112	140	168	149	187	224	233	280	327	336
30	20	30	40	50	60	70	30	45	60	75	90	105	40	60	80	100	120	90	120	150	180	160	200	240	250	300	350	360
32	21	32	43	53	64	75	32	48	64	80	96	112	43	64	85	107	128	96	128	160	192	171	213	256	267	320	373	384
34	23	34	45	57	68	79	34	51	68	85	102	119	45	68	91	113	136	102	136	170	204	181	227	272	283	340	397	408
36	24	36	48	60	72	84	36	54	72	90	108	126	48	72	96	120	144	108	144	180	216	192	240	288	300	360	420	432
38	26	38	51	63	76	89	38	57	76	95	114	133	51	76	101	127	152	114	152	190	228	203	253	304	317	380	443	456
40	27	40	53	67	80	93	40	60	80	100	120	140	53	80	107	133	160	120	160	200	240	213	267	320	333	400	467	480
42	28	42	56	70	84	98	42	63	84	105	126	147	56	84	112	140	168	126	168	210	252	224	280	336	350	420	490	504
44	29	44	59	73	88	103	44	66	88	110	132	154	59	88	117	147	176	132	176	220	264	235	293	352	367	440	513	528
48	31	46	61	77	92	107	46	69	92	115	138	161	61	92	123	153	184	138	184	230	276	245	307	368	383	460	537	552
48	32	48	64	80	96	112	48	72	96	120	144	168	64	96	128	160	192	144	192	240	288	256	320	384	400	480	560	576
50	33	50	67	83	100	117	50	75	100	125	150	175	67	100	133	167	200	150	200	250	300	267	333	400	417	500	583	600

#### NAILS REQUIRED FOR DIFFERENT KINDS OF WORK.

FILE 694 231

For 1,000 shingles,  $3\frac{1}{2}$  to 5 lbs. 4d. nails, or 3 to  $3\frac{1}{2}$  lbs. 3d.

For 1,000 laths, about 7 lbs. 3d. fine.

For 1,000 feet clapboards, about 18 lbs. 6d. box.

For 1,000 feet covering boards, about 20 lbs. 8d. common, or 25 lbs. 10d.

For 1,000 feet upper floors, square edged, about 38 lbs. 10d. floor, or 41 lbs. 12d. floor. For 1,000 feet upper floors, matched and blind-nailed, 38 lbs. 10d or 42 lbs. 12d. common.

10 feet partitions, studs or studding, 1 lb. 10d. common. For

For 1,000 feet furring, 1x3, about 45 lbs. 10d. common.

For 1,000 feet furring, 1x2, about 65 lbs. 10d. common

For 1,000 feet pine finish, about 30 lbs. 8d. finish.

# OVERLAYING CONSTRUCTION SHEET, SHINGLE AND COMPOSITION COVERING.

FILE 898.1

The average width of a shingle is four inches. Hence, when shingles are laid four inches to the weather each shingle averages 16 square inches, and 900 are required for a square of roofing (100 square feet). If  $4\frac{1}{2}$  inches to the weather, 800; 5 inches, 720;  $5\frac{1}{2}$  inches, 655; 6 inches, 600.

#### Slating.

FILE 695.2

Slating is estimated by the "square," which is the quantity required to cover 100 square feet. The slates are usually laid so that the third laps the first three inches.

Number of Slates per Square.

Size in Inches.	Pieces per Equare.	Size in Inches.	Pieces per Square.	Size in Inches.	l'i ces per Square.
6 × 12	533	8 × 16	277	12 × 20	141
$7 \times 12$	457	$9 \times 16$	246	$14 \times 20$	121
$\begin{array}{c c} 8 \times 12 \\ 9 \times 12 \end{array}$	$\frac{400}{355}$	$\begin{array}{c c} 10 \times 16 \\ 9 \times 18 \end{array}$	$\frac{221}{213}$	$\begin{array}{c c} 11 \times 20 \\ 12 \times 22 \end{array}$	$\frac{137}{126}$
$7 \times 13 $ $7 \times 14$	374	$10 \times 18$	192	$14 \times 22$	108
$8 \times 14$	327	$13 \times 18$	160	$12 \times 24$	114
$9 \times 14$	291	$10 \times 20$	169	$14 \times 24$	98
$10 \times 14$	261	$\parallel$ 11 $\times$ 20	154	$16 \times 24$	86

The weight of slate per cubic foot is about 174 pounds, or per square foot of various thicknesses as follows:

The weight per square foot of roof tiling, set in iron or between wood rafters ready for slating, is about 12 pounds.

#### Tin Roofs.

FILE 695.4

Tin roofs should be laid with cleats.

There are two kinds of tin—"bright tin," the coating of which is all tin, that is, the tin proper; and "tern," "leaded," or "roofing" tin, the coating of which is a composition, part tin and part lead. This last will not rust any quicker, but the sulphur in soft coal smoke eats through the "leaded" coating sooner than through the "tinned."

Sizes of tin, 10 by 14 and 14 by 20, and two grades of thickness—IC light, and IX, heavy. For a steep roof (one-sixth pitch or over) the IC 14 by 20 tin ("leaded" if high up where little smoke will get to it; "bright" if low down), put on with a standing groove, and with the cross seams put together with a double lock, makes as good a roof as can be made. For flat roofs IX 10 x 14 "light" is best, laid with cleats, but the others make good roofs and any of them will last twenty-five years at least, if painted periodically.

Number of Square Feet a Box of Roofing Tin Will Cover.—For flat seam roofing, using ½-inch locks, a box of "14 by 20" size will cover about 192 square feet, and for standing seam, using 3-inch locks and turning 14 and 1½ inch edges, making

1-inch standing seams, it will lay about 168 square feet.

For flat seam roofing, using ½-inch locks, a box of "28 by 20" size will cover about 399 square feet, and for standing seam, using ¾-inch locks and turning 1¼ and 1½ inch edges, making 1-inch standing seams, it will lay about 365 square feet.

Every box of roofing plates (IC or IX "14 by 20" or "28 by 20" sizes) contains

112 sheets.

For roofs and gutters use seven-pound lead; for hips and ridges, six-pound; for flashings, four-pound.

Gutters should have a fall of at least one inch in ten feet.

No sheet lead should be laid in greater length than ten or twelve feet without a dip to allow for expansion.

Joints to lead pipes require a pound of solder for every inch in diameter.

## GRAVEL ROOFING SPECIFICATIONS.

Adopted by the Chicago Master Composition Roofers'
Association.

First lay five (5) thicknesses of No. 2 wool roofing felt, weighing not less than fourteen (14) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together, mopping not less than (20) inches between each layer, with best roofing cement, using not less than one-hundred and twenty-(120) pounds of roofing cement to the square of one hundred feet. All joinings along the walls and around the openings to be carefully made. Then cover the entire surface with a coating of rooting cement and screened gravel, using not less than one-sixth (1-6) of a cubic yard of gravel to the square of one-hundred (100) feet. The gravel to be what will pass through not larger than a % inch mesh screen and to be free from sand and Joam

This roof shall be guaranteed for a period of five (5) years.

N. B.—Over open board construction and all buildings not plastered, use one (1) thickness of rosin sized sheathing paper.

Following are three old standard specifications used in the west for many years.

## Five (5) Ply Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred (100) nounds of roofing cement to the square of one hundred (100) feet. All joinings along walls and around openings to be carefully The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic vard of gravel to six hundred (600) square feet. gravel to be screened through %-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

## Six (6) Ply Cap Sheet Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (103) This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred and twenty (129) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt All joinings along the walls and applied. around the openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through %-inch mesh and free from sand and loam. All walls and openings to be Hashed. If not, the rear end of the walls to be Cashed not less than fifteen (15) feet from the gutter on each side.

## Six (6) Combined Flax and Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put one (1) layer of flax felt and three thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap. not less than eleven (11) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be morned over with rooting cement and a cap sheet of wool felt applied. ings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through %-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

## SANITARY AND ELECTRIC POWER EQUIPMENT

#### INCLUDING PLUMBING, ILLUMINATION AND ELECTRIC POWER

#### Capacity of Cisterns.

FILE 696

For a circular cistern, square the diameter and multiply by .7854, for the area; multiply this by 1,728 and divide by 231, for number of gallons of one foot in depth; for a square cistern, multiply length by breadth, and proceed as above.

#### CIRCULAR CISTERN.

- 5 feet in diameter holds 4.66 bbls.
- 6 feet in diameter holds 6.71 bbls.
- 7 feet in diameter holds 9.13 bbls.
- 8 feet in diameter holds 11.93 bbls.

#### 9 feet in diameter holds 15.10 bbls. 10 feet in diameter holds 18.65 bbls.

#### SQUARE CISTERN.

- 5 feet by 5 feet holds 5.92 bbls.
- 6 feet by 6 feet holds 8.54 bbls.
- 7 feet by 7 feet holds 11.63 bbls.
- 8 feet by 8 feet holds 15.19 bbls.
- 9 feet by 9 feet holds 19.39 bbls.
- 10 feet by 10 feet holds 23.74 bbls.

#### Wrought=iron Welded Pipe.

DIMENSIONS, WEIGHTS, ETC., OF STANDARD SIZES FOR STEAM, GAS, WATER, OIL, ETC.

Inside Diam- eter	Outside Diam- eter	External Circum- ference, A	Length of Pipe per Sq. Foot of Outside Surface.	Internal Area	External Area.	Length of Pipe con- taining one Cubic Foot.	Weight per Foot of Length	No. of Threads per Inch of Screw.	Contents in *Gallons per Foot.	Weight of Water per Foot of Length.
In. 1.8 1.4 5.4 5.4 1.4 1.4 2.4 2.4 4 4 5.6 7 8 9 10	In 40 .54 67 84 1 05 84 1 05 84 1 05 84 4 1 05 85 8 4 4 5 5 .56 62 7 .62 8 62 7 .62 8 68 10 75	In. 1 272 1.656 2.121 2 652 3 299 4 134 5.215 5.969 7.461 9 032 10 996 12.566 14 137 15 708 17 475 20 813 23 994 27,096 30 433 33 772	Ft. 9.44 7.075 5.657 4.502 3.637 2.903 2.301 2.01 1.611 1.325 1.091 9.55 5.49 7.65 6.29 5.77 5.505 4.44 3.355	In. 012 049 110 196 441 755 1.277 1.767 3.141 4.968 7.068 9.621 12.560 15.904 19.635 25.274 35.454 50.265 63.617 78.540	Iu 129 229 335 554 866 6.3,357 2 164,42 2 \$35 6.491 9.621 12 566 13.904 19 623 59 434 43.663 58 426 73.715 90.792	Ft 2,500 :.385	Lbs24 42 56 84 1.12 1 67 2.25 2.69 3.66 5.77 7.54 9 95 10.72 12.49 14.56 18 76 40 64	27 18 14 14 11 11 11 11 8 8 8 8 8 8 8 8 8	.0006 .0026 .0027 .0023 .0408	Lbs. 005 021 047 085 190 349 527 760 1.356 2.116 3 049 4 155 5.405 6.851 8.500 12.312 16.662 21.750 27.500 34.000

<sup>\*</sup> The Standard U. S. gallon of 231 inches.

Divide the external circumference column, A, by 12 and the result will be the square feet of surface per lineal foot.

#### Grade Per Mile.

The following table will show the grade per mile:

An inclination of

- 1 foot in 15 is 352 feet per mile.
- 1 foot in 20 is 264 feet per mile.
- 1 foot in 25 is 211 feet per mile.
- 1 foot in 30 is 176 feet per mile.
- 1 foot in 35 is 151 feet per mile.
- 1 foot in 40 is 132 feet per mile.
- 1 foot in 50 is 106 feet per mile.
- 1 foot in 100 is 53 feet per mile.
- 1 foot in 125 is 42 feet per mile.

To find quantity of water elevated in one minute running at 100 feet of piston speed per minute: Square the diameter of the water cylinder in inches and multiply by 4. Example: Capacity of a 5-inch cylinder is desired. The square of the diameter (5 inches) in 25, which, multiplied by 4, gives 100, the number of gallons per minute (approximately).

#### Quantity of Brickwork in Barrel Drains and Wells.

Diameter in Clear	Thickness of Brickwork	Superficial Feet of Brick- work in One Linear Yard.	Number of Bricks Required for One Linear Yard
1 foot, o nuches 1 " 6 " 2 " 0 " 2 " 0 " 2 " 6 " 3 " 0 " 3 " 0 " 3 " 6 " 3 " 6 " 4 " 0 " 4 " 0 " 5 " 0 " 6 " 0 "	o feet, 4½ inches  o " 4½ "  o " 4½ "  o " 4½ "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "  o " 9 "  i " 1 "	16 feet, 6 inches 21 " 2 " 25 " 10 " 33 " 0 " 37 " 8 " 43 " 2 " 42 " 6 " 47 " 10 " 47 " 1 " 52 " 7 " 51 " 10 " 57 " 3 " 66 " 9 " 76 " 1 " 85 " 6 "	115 148 181 462 528 906 594 1004 659 1104 725 1203 857 1402 1597

#### Tests for Pure Water.

Color: Fill a clean long bottle of colorless glass with the water; look through it at some black object. It should look colorless and free from suspended matter. A muddy or turbid appearance indicates soluble organic matter or solid matter in suspension. Odor: Fill the bottle half full, cork it, and leave it in a warm place for a few hours. If when uncorked it has a smell the least repulsive, it should be rejected for domestic use. Taste: If water at any time, even after heating, has a disagreeable taste, it should be rejected.

A simple semi-chemical test is known as the "Heisch test." Fill a clean pint bottle three-fourths full of the water; add a half-teaspoonful of clean granulated or crushed loaf sugar; stop the bottle with glass or a clean cork and let it stand in a light and moderately warm room for forty-eight hours. If the water becomes cloudy, or

milky, it is unfit for domestic use.

#### Capacity of Drain Pipe.

			G	ALLONS P	ER MINUT	re.		
SIZE OF PIPE.	½-in. Fall per 100 ft.	3-in.Fall per 100 fi.	6-in. Fall per 100 ft.	9-in. Fall per 100 ft.	12-in. Fall per 100 ft.	18-in. Fall per 100 ft.	24-in Fall per 100 ft.	36-in. Fal per 100 ft
3-inch	21	30	42	52	60	74	85	104
4 "	36	52	76	92	108	132	148	184
U	84	120	169	206	240	294	338	414
J	232	330	470	570	660	810	930	1140
12 ''	470	680	960	1160	1360	1670	1920	2350
15 "	830	1180	1680	2040	2370	2920	3340	4100
18 "	1300	1850	2630	3200	3740	4600	5270	6470
20 "	1760	2450	3450	4180	4860	5980	6850	8410

#### Table showing the velocity of discharge of different sized sewers.

Diam. of pipe.		per minute, per second.		per minute, per second.		per minute, er second.		per minute, er second.
Inches.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.
4 6	1 in 92 1 in 138	96 216	1 in 30.4 1 in 40.8 1 in 61.2 1 in 92.	144	l in 17.2 1 in 23. 1 in 34.5 1 in 51.7	192 432	1 in 7.6 1 in 10.2 1 in 15.3 1 in 23	288

#### HEATING VENTILATION AND STEAM POWER.

#### Hot-Water and Steam Heating-Overhead System.

In using steam for the heating of high buildings, it is necessary to use the overhead plan, unless some automatic system of expelling the air is adopted. It requires less power to force the air through the standpipe than it would through a large number of risers. The air is forced out on the descent of the steam, and less fuel and power are necessary.

The overhead hot-water system is coming into general use, as it can be put in so that the farthest radiators in a building will heat at the same time as those nearer the boiler, and the result will also be felt in rooms in the basement—the

principle of the siphon causing the effect.

The pipes from the main in the attic, from which the several branches are taken, can be pitched so that heat in the several parts of a building will result as quickly as desired; either an open or closed tank can be used. The pipes exposed in attic should be covered. Opinions vary as to the sizes of pipe to be used.

#### List of Sizes of Steam Mains.

To determine the size of pipes no fixed rule can be given which will apply in all cases. A rule that has generally been accepted by steam fitters as good practice. is to allow the area of a one-inch pipe (.7854 square inches) for every 100 square feet of radiating surface, including mains.

#### BOILER EFFICIENCY TABLE Based on evaporation from and at 212° F'

	50 Efficie	ney	55 Efficie		60 Effici	% ency	65 Effici	% ency	70 Effici		75 Effici	% ency	80 Effici	ency
B. T. U. Per Lb.	Evaporation Per Lb. Coal.	ss. Coal r H. P. Hour.	Evaporation Per Lb. Coal.	es. Coal r II. P. Hour.	Evaporation Per Lb. Coal.	os. Coal r II. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	bs. Coal er H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	os. Coul rr H. P. Hour.
Coal.	Eva	Llss. Per He	EV.	Lbs. Per He	Eva P	Lbs. Per He	EV3 P	Per H	EVE P	Lbs. Per He	Eva P	Per H	Eva	Lbs. Per Hc
7500	3.5	9.0	4.2	8.2	4.6	7.5	5.0	6.8	5.4	6.4	5.8	6.0	6.2	5.5
8000	4.1	8.4	4.5	7.6	4.9	7.0	5.3	6.5	5.7	6.0	6.2	5.5	6.6	5.2
\$500	4.4	7.8	4.8	7.1	5.2	6.6	5.7	6,0	6.1	5.6	6.6	5.2	7.0	4.9
9000	4.6	7.5	5.1	6.7	5.5	6.2	6.1	5.5	6.5	5.3	6.9	5.0	7.4	4.6
9500	4.9	7.0	5.4	6.3	5.9	5.8	6.3	5.4	6.8	5.0	7.3	4.7	7.8	4.4
10000	5.1	6.7	5.6	6.1	6.2	5.5	6.7	5.1	7.2	4.7	7.7	4.4	8.2	4.2
10500	5.4	6.3	5.9	5.8	6.5	•5.3	7.1	4.8	7.6	4.5	8.1	4.2	8.6	4.0
11000	5,6	6.1	6.2	5.5	6.8	5,0	7.4	4.6	7.9	4.3	8.5	4.0	9.1	3.7
11500	5.9	5.8	6.5	5.3	7.1	4.8	7.7	4.4	8.3	4.1	8.9	3.8	9.5	3.6
12000	6.2	5.5	6.8	5.0	7.4	4.6	8.0	4.3	8.6	4.0	9.3	3.7	9.9	3.4
12500	6.4	5.3	7.1	4.8	7.7	4.4	8.4	4.1	9.0	3.8	9.7	3.5	10.3	3.3
13000	6.7	5.1	7.4	4.6	8.0	4.3	8.7	3.9	9.4	3.6	10.0	3.4	10.7	3.2
13500	6.9	5.0	7.6	4.5	8.3	4.1	9,0	3.8	9.7	3.5	10.4	3.3	11.1	3.1
14000	7.2	4.7	7.9	4.3	8.6	4.0	9.4	3.6	10.1	3.4	10.8	3.2	11.5	3.0
14500	7.5	4.6	5.2	4.2	9.0	3.8	9.7	3.5	10.5	3.2	11.2	3.0	12.0	2.8

#### SPACE OCCUPIED BY FUEL.

Coals of the same size coming from different mines vary in density, but the space given below is an average for best fuels:

Stove Anthracite	33	$\mathbf{c}$ ubic	feet per	2,000	lbs.
Egg Anthracite	32.5	cubic	feet per	2,000	lbs.
Soft Coal	40	cubic	feet per	2,000	lbs.
Coke	68	cubic	feet per	2,000	lbs.

Transmission of Heat by Various Substances. FILE 697 0
Window glass being
Oak or Walnut
White Pine
Pitch "
Lath and Plaster
Brick (rough)
"Whitewashed
Granite or Slate
Sheet Iron

## Table Showing Amount of Glass Surface which may be Heated by I Square Foot of Radiating Surface in Good Buildings.

		Hot Water.		Ste	am.
Temperature of radiating surface (radiators) Fahr	160°	180	200°	227° 5 Lbs.	240° 10 Lbs.

Temperatur	e above si	arroundir	ıg air	90°	1.9	2.3	2.8	3.3	3.8
144	1.1	1.4		80°	2.3	2.9	8.5	4.0	4.6
	6 6	1.4	4.4	70	3.0	3.6	4.2	5.0	5.7
4.5	4 6	1.1	4 6	60°	4.0	4.6	5.25	6.0	7.0
w 6	4 4	4 1		50°	5.0	6.0	6.8	8.0	9.0
	: (	6.4	6 6	40	6.9	8.0	8.2	10.0	11.5

#### Formulae for Figuring Radiation for Factories.

A formula for figuring radiation which is used by some of the best heating engineers in determining the amount of radiation for factory buildings is as follows:  $\frac{G}{3.3} + \frac{W}{40.9} + \frac{V}{171} =$  sq. ft. of radiation in which, G = Glass Area. W = Net Wall Area. V = Volumn of air in the Room.

#### Proportion of Parts of Steam Heating Boilers.

FILE 697.43

FROM PROF. R. C. CARPENTER.

Radiating surface=square feet	250	500	750	1000	1500	2000	3000	4000	5000	7500	10000
Nominal horse-power	2.5	5.0	7.5	10.0	15.0	20.0	30.0	40.0	50,0	75.0	100.0
Ratio radiating to heating surface	4.5	5.1	5.4	5.6	6 0	6.2	6.7	6.9	5 7.0 1 9.0*	7.0 9.0*	$\frac{7.0}{9.0}$
Probable evaporation per lb. coal	5.5	5.7	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10 0
Pounds of steam per sq. ft. $grate(A)$	55.0	57.0	60.0	65.0	70.0	75.0	80.0	85.0	90-0	95.0	100.0
Pounds of s'eam per sq. ft. grate (B)		46.0	48.0	52.0	56 0	60.0	64.0	68.0	72.0	76.0	80.0
Ratio radiating to grate surface (A)	165.0	171.0	180.0	195.0	210.0	225 - 0	240.0	255.0	270.0	285.0	300.0
Ratio radiating to grate surface (B)	132.0	138.0	144.0	156.0	163.0	180.0	192.0	.204 - 0	216.0	228.0	240.0
Ratio heating to grate surface $(A)$	36.5	33.2	33.2	34.8	35.0	\$6 <b>2</b>	36.5	37.0	38.5	\$ 40.5 31.5*	$\frac{42.5}{33.3}$
Ratio heating to grate surface (B)	28.5	27.0	26.7	27.7	28.0	29.0	29.3	29.6	30.8	) 32.2   25.2*	34 5 26.5
Heating surface, square feet	55.0	98.0	138.0	178.0	250.0	322 0	147.0	580.0	710.0	) 1071   833*	1430 1111*
Grate surface, square feet (A)	1.52	2.92	4.15	5 68	7.15	8.9	12.4	15.7	18.5	26.5	33 3
Grate surface, square feet (B)	1.88	3.88		6.37	8.92	11.2	15.5	19.5	23.2	32.5	41.5
Diameter of safety valve, inches	1.5	2.25				3.25	3.5	4.2	4.0	2 of 3	2 of
Diameter of smoke flues, inches	7.0	10.0	11.2		15.0	17.0	19.0	23.0	25.0	28	3A
Square inches in above flues		78.5		113.0				415.5	490 9	615.7	907.

<sup>\*</sup>Water tube boilers.

A When rate of coal consumption is 10 pounds per hour each square foot grate surface.

B When rate of coal consumption is 8 pounds per hour each square foot grate surface.

# PROTECTIVE, PRESERVATIVE AND DECORATIVE COVERINGS.

FILE 898

#### ESTIMATES ON PAINTING.

By EMERY STANFORD HALL, B. S.

PAINTER'S ESTIMATE=(units of surface to be covered) × (amount of material required to cover a unit) × (cost of a unit of material) + [(number of hours of labor required by a mechanic to apply the material to a single unit of surface) × (hourly wage of mechanic) × (number of units of surface)] + (overhead charges, including scaffolding, brushes, drop-ctoths, cartage, office expense and expense of supervision, etc.) + (Contractor's profit, which varies with the supply and demand).

UNITS OF SURFACE USED ARE (one sq. ft.), (sq. yd.=9 sq. ft.) or (square=109 sq. ft.).

AMOUNT OF SURFACE UNITS assumed for estimating purposes are increased at the judgment of the estimator. This is done to make proper allowance for increased labor and waste of material on account of broken and complicated surfaces, and so that prices per unit of labor and material can be maintained constant, the following enumerations being the assumptions most commonly used by estimators:

PLAIN D. & M. Wainscoting or partition stuff is measured once, actual surface, and is used as the standard of comparison. Other surfaces are increased in proportion as their difficulty of execution compares with D. & M. Wainscoting.

Sash for exterior are measured over the entire area instead of around each bar.

Shingle Gable,  $1\frac{1}{2}$   $\times$  actual surface area. Dormer Windows 2  $\times$  actual surface area. Shingles, Rough,  $1\frac{1}{2}$  to 2  $\times$  actual surface area.

Shingles, Dressed, Dimension, actual surface measure.

Spindle work, measure 4 times solid on one side.

Square Spindle work and pickets,  $4 \times$  one side measured solid.

Verandas with heavy columns and railings, etc., measure surface of ceiling and floors and all sides the same as though enclosed veranda. Very simple in design, measure floor and ceiling and allow double area of brackets and columns.

Outside Blinds, measure 3  $\times$  actual surface of one side.

#### INTERIOR.

Base Bcards, measure not less than 1 foot in width regardless of actual width.

**Picture Mouldings,** measure 1-3 foot in width.

Single Doors, including trim, count as 35 sq. ft. to a side or 70 sq. ft. for both sides.

Interior Side of Windows, including trim and tracing of sash, average at 35 sq. ft.

Wall Decorations, measure ceiling solid and sidewalls 8-10 of actual area to allow for openings, or measure actual area and deduct ½ to % of all openings.

Badly Weathered wood work or cracked and damaged plaster, add from 1-10 to 3-10 to measurements determined as above.

#### MATERIALS, COVERING POWER OF.

White Lead Paste averages to contain by bulk 92% dry lead pigment and 8% linseed oil and weighs about 38.1206 lbs. to the gallon of bulk.

**Carbonate** of **Lead** = chemically to Pb OCO<sub>2</sub>, was the lead formerly used in paints as a pigment. The fumes of this preparation

of lead are poisonous and workmen have to be very careful in handling this material to avoid soiling hands or inhaling fumes from the same.

Sublimed Lead or Basic Lead Sulphate = chemically to PbSO<sub>4</sub>, is coming into general use for paints and is practically nonpoisonous and just as valuable as a pigment.

Linseed Oil weighs about 7½ lbs. to the gal. of bulk,

Turpentine weighs about 7 lbs. to the gal. of bulk.

Primer of Lead and Gil for new work should be proportioned by bulk, so as to contain 27% of White Lead Paste, 62% of Linseed Oil and 11% of Turpentine.

Priming Lead and Oil will require 10.3 lbs. White Lead, .62 gal. Linseed Oil and .11 gal. Turpentine to make one gal. of paint.

One Gallon Lead and Oil Frimer will average to properly cover about 2% squares of new wood work or 1% squares of common brick work.

One Square of New Wood Work requires to properly prime same with lead and oil 3% lbs. White Lead, .23 gal. Linseed Oil and .04 gal. Turpentine, or it common brick requires 8.24 lbs. White Lead, .5 gal. Linseed Oil and .088 gal. Turpentine.

Succeeding Coats of Lead and Oil Paint after primer should be proportioned by bulk so as to contain 30% White Lead, 64% Linseed Oil and 6% of Turpentine.

Succeeding Coats of Lead and Oil Paint after priming will require 11.44 lbs. White Lead Paste, .64 gal. Linseed Oil and .06 gal. of Turpentine to the gal.

Cne Gallon Lead and Oil Succeeding Coater will average to properly cover, any coat, about 4½ squares of wood work after same has been primed, or 3 squares of common brick work, second coat. Third coat on brick work, one gal. will cover as much surface as on wood.

One Square of Any Oil Succeeding Coat on wood work after same has been primed will average to require to properly cover same 2.54 lbs. White Lead, .14 gal Linseed Oil and .0133 gal. of Turpentine; or for 2nd coat on common brick work, 3.48 lbs. White Lead, .21 gal. Linseed Oil and .02 gal. of Turpentine. (Third coat on brick work will require the same amount of paint to unit of surface as "Succeeding Coats" on wood.)

Paste Filler for open grained hard-wood finish or floors requires for proper filling and wiping 1% lbs. Silex paste and .14 gal. thinner to the square.

Wiping of paste filler is done with burlap, sea moss or excelsior and should always be done across the grain of the wood as if rubbed with the grain of the wood there is a tendency to lift the filler out of the pores of the wood and waste same, requiring more filler to give satisfactory results.

Thinner for paste filler may be either Turpentine or Benzine if the filler is of best quality of rock quartz, water floated, very finely bolted and mixed with special Japans and Linseed Oil, Benzine seems to give the most satisfactory results for a thinner owing to its quicker evaporation. For the cheaper fillers Turpentine must be used.

Paste Filler is tinted or left transparent according to the color effect desired.

Stains for wood work usually form one coat in addition to filler and coats of varnish or wax; these are of three kinds, oilstain, spirit-stain and water-stain, and are used according to the effect desired.

Oil-Stain averages to require about .16 gal. to the square.

Spirit-Stain averages to require about .16 gal. to the square.

Water-Stain averages to require about .2 gal. to the square.

**Prepared Wax** averages to require about .33 lbs. to the square.

Varnish, Best Light Interior, requires for properly coating one square, 1st coat over filler, 1-5 to 1-7 gal.

Varnish, Cheap, Thick Rosin, requires for coating one square one gloss coat, ¼ to 1-5 gal.

Creosote Stain required to dip 24 length one M. shingles equals about 234 gal.

Creosote Stain required to brush coat one square shingles equals one gal.

Oil Paint to cover one square metal work, one coat requires about 1-10 gal.

**Prices** of standard materials are quoted in market reports and fluctuate with supply and demand. The estimator should verify these preceding each estimate. At time of going to press the following prices obtain:

White Lead Paste, 634c per 1b.

Linseed Oil, 54c per gal.

Turpentine, 56c per gal.

Paste Filler. about 10c per lb. in 100-lb. packages or 8½c in bbls.

Interior Varnishes, about \$2.00 per gal.

Stains vary so much in price that they can not be listed.

First Class Exterior Varnishes, about \$3.50 per gal. (It should be explained that owlng to the slow drying or hardening qualities of best exterior varnishes, a cheaper and less durable grade is usually used, costing about \$2.50 per gal.)

Proprietary Oil Paints of best quality are sold to the painters at about \$1.55 per gal, depending on color. The materials in a gal of White Lead and Linseed Oil "Succeeding Coat" of paint costs exclusive of labor and coloring matter about \$1.20 at present market prices and the labor of mixing by hand and the expense for colors brings this hand-mixed paint up in price to about the same as proprietary paints of equal quality. Unless the ingredients composing paint are thoroughly incorporated the paint is not satisfactory. This proper mixing, if done by hand, requires considerable expensive labor.

Chemical action between the pigments and oil in paint ordinarily does not occur, but there are exceptions. Sabin states that such action takes place with White Lead and Linseed Oil. "probably between the oil and the lead hydrate, which constitutes at least a quarter of the pigment." "This change is said to be due to resinification of the oil converting into a sort of varnish." "Zinc Oxide (White Zinc) also acts on oil, but in a much less degree." "Paint consisting of White Lead and White Zinc mixed together in the proportions of two of lead to one of zinc is reputed to be superior to either alone. Zinc brushes more readily, but will cover less surface than White Lead."

Linseed Oil is the only known universally successful binder for paint and the holding power of the paint depends almost entirely on the strength of the linseed oil used. This oil is adulterated in many ways, but the most common is with mineral oil. The mantafacturers of mineral oil substitute have perfected their product to such an extent that it is difficult to distinguish it from the real article except by chemical test or actual use, when its inferiority is quickly manifest.

#### LABOR REQUIRED.

COST OF LABOR = (number of hours of labor required by a mechanic to apply the material to the single unit of surface) × (hourly wage of mechanics) × (number of units of surface).

Wage per Hour = union scale obtaining in the locality where the work is to be executed. (In Chicago, this is 65c per hour under an agreement expiring April 1st, 1909.)

Stopping knots with shellac requires in labor 2 of an hour's time to the square of surface.

Puttying defects in ordinary wood work requires in labor .3 of an hour's time to the square of surface.

Oil painting, single coat, requires in labor .57 of an hour's time to the square of surface.

Paste Filler Coat, including cleaning of wood work, requires in labor 1.33 hours' time to the square of surface.

Varnish, single coat, including light sandpapering, requires in labor .66 of an hour's time to the square of surface.

Creosote staining of shingles by 24 dipping, requires in labor 1 hour of a mechanic's time to dip 1,000 shingles, which average to cover when laid, one square of roof surface.

Creosote staining, one brush coat on roof, requires in labor .S hour's time to cover one square of surface.

Sizing of plaster walls with either glue or bard oil size requires in labor .33 of an hour's time to the square of surface.

Tinting with water color, fresco tints or calcimine averages to require in labor .44 hour's time to the souare of surface to the man employed, providing not less than two men are employed on the work. (Ordinarily, one man cannot work alone at tinting of walls, for if he does so work, the work cannot be satisfactorily done and more time is required in proportion to the surface covered.)

Sponging and washing walls requires in labor a variable amount of time to the square according to the amount of size used in coat to be removed and must be approximated by the estimator after examination and test.

#### ILLUSTRATIVE CHARGES FOR CON-TRACT WORK.

The following items illustrate some of the average charges made by contractors for material and labor at the time of going to press:

Whitewashing (machine applied) including material labor and contractor's profit, about 27c per square, varying according to the size of the job, sometimes, in case of very large jobs, being figured as low as 8½c.

Whitewashing (hand brush applied), including material and labor and contractor's profit, about 55c per square.

Painting, two coat work, is estimated as worth \$2.35 per square; itemized, 52c for all material and \$1.83 for labor and profit.

Varnish work, including one coat of paste filler and two coats of varnish, is worth about \$2.60 per square.

Sizing walls is worth about 75c per square for hard oil size.

Tinting walls, depending on color, averages to be worth 85c per square.

#### FIXED CHARGES.

The expenses of conducting the painting contracting business vary according to the efficiency of organization and range from 25 to 35 per cent of the cost of executing the work.

#### THE ESTIMATE.

After surfaces are measured and materials and labor are priced, as described above, and items totalled, about 30 per cent should be added to cover fixed charges and a percentage for profit, varying according to the reputation of the contractor, which will give the probable contract price of the work.

## THE ORDERS AND THEIR APPLICATION.

By ALFRED W. S. CROSS, M. A., F. R. I. B. A, and ALAN E. MUNBY, M. A.

#### THE SETTING UP OF AN ORDER.

(To be studied in connection with Plates I., II., III., IV. and V.)

The sequence followed in setting up an Order will be found to influence, to some extent, the rapidity and facility with which it can be accomplished. An outline of the method of procedure may, therefore, prove useful.

Usually the height of the Order is fixed by circumstances, as, for example, when it is to be applied to a given story of a building.

The total height having been settled, draw the limiting horizontal lines and then set out the vertical centre lines of the columns, thus dividing the frontage to be treated into bays appropriate to the exigencies of the design and having due regard to the correct intercolumniation of the Order adopted. If a pedestal is to be placed under the column, cut off one-fifth of the total height for it, and cut off one-fifth or one-sixth of the remainder (measured from the top limiting horizontal line) for the vertical height of the entablature: the intervening space gives the height of the column, including its cap and base. If no pedestal is to be used, divide the whole of the given height into five or six parts, cut off one of these parts, from the top, for the entablature, and the remainder gives the height of the column.

The Column. Since some of the dimensions of the entablature are in terms of the di-ameter of the column, the latter should be next developed. The term "diameter of the column" refers always to its greatest diameter—namely, that of the shaft just above the lower cincture. This dimension is one-sevent, to one-tenth of the height between the soffit of the entablature and the top of the pedestal, or lower limit of the Order in the absence of a pedestal. If the centre lines of the piers do not represent the centres of the columns, as, for instance, when coupled columns are used, the centre line of one of the columns must now be decided upon and the diameter of the Order symmetrically disposed horizontally across it. A semi-diameter is then cut off, from the bottom of the column, for the height of the base, and it should be noticed that this—except in the Tuscan and alternative Doric Orders—does not include the fillet at the base of the shaft, not include the first at the base of the shart, the members above the upper forus being reckoned as part of the shaft, as are also the astragal and fillet below the necking of the capital of the column. The plinth and lower torus of the base project one-third and the upper torus one-fifth of a semi-diameter beyond the lower circumference of the shaft. The leading lines for the base having thus been obtained, cut off by a horizontal line the height of the capital from the top of the column, and (except in the Ionic Order) again below it, a height equal to one-sixth of a semi-diameter for the astragal and fillet below the necking.

The semi-diameter of the shaft at one-third of its height from the bottom is then divided into five or six parts, and four or five of these parts are taken as a semi-diameter at the top, below the astragal. The shaft may now be completed, the entasis being usually made to start from the greater diameter, one-third up the shaft, below which point it is a true cylinder until the cincture at the base is reached. This is the best method to adopt in the case of small scale drawings. Where large detailed drawings are in question the diameter may be alternatively divided at the base of the shaft instead of at one-third of

its height, and the entasis extended throughout the whole length. The completion of the shaft enables the projection of the capital to be marked off, and also that of the astragal and fillet, which is equal to their combined height.

The Entablature. The development of the entablature can now be proceeded with, the architrave, frieze and cornice being ruled off horizontally and the members of each inserted (see dimensions). The projections for a returned end or section are obtained from the upper diameter of the shaft. The lowest member of the architrave, and also the frieze, lie vertically over the circumference of this upper end of the shaft. The projection of the cornice beyond the frieze line is equal to its height, except in the Doric Order, in which the projection is one-third more than its height of one diameter. Further rules dealing with minor projections and the position of the modillions, dentils, etc., will be supplied by a study of the plates and tabulated dimensions.

Pedestal. Finally, the pedestal, if any, should be divided vertically into four parts: the lower part is ruled off for the height of the plinth, one-third of the second part for the height of the base, and one-half of the top part for that of the cap. The projection of the die is equal to that of the base of the column, and the plinth and the cap of the pedestal extends beyond this for a distance equal to the height of the base of the pedestal previously obtained.

The above dimensions will all be found in the subjoined table, which represents an endeavour to bring together, in a form suitable for reference, sufficient information to make any glaring disproportion impossible.

A few of the minor divisions are only approximations; they will, however, be found to be sufficiently accurate for any but large detail drawings, in which it is not desirable to destroy all individuality by rigorous mechanical rules.

On the left hand will be found the dimension required and, in the intermediate column the fraction for each Order of the previously ascertained unit given in the right-hand column.

#### Plate I.

Plate I. represents the four Orders drawn to a common vertical height.

The pedestal may or may not be required and, if used, it is to be regarded as an addition to the Order, the relative dimensions of the parts of which are not altered by its removal or introduction.

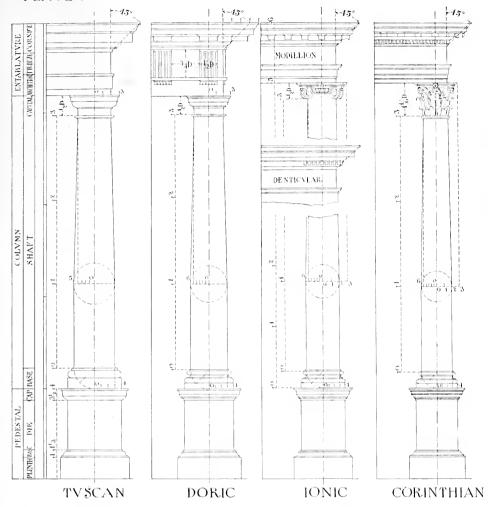
The diameter of the column (by which is meant the diameter of the shaft following its lower cincture) is the ruling dimension from which most of the others are obtained, and the smaller circumference of the top of the shaft always coincides with the frieze line from which all the projections of the entablature are set out.

In judging the value of such projections it should be borne in mind that in execution the higher vertical faces of the composition will usually be much foreshortened to the observer and that there will be a consequent increase in the comparative value of neighboring projections.

A perusal of the table will indicate those dimensions which all the Orders have in common, but for convenience of reference they are further summarized thus:

Height of Pedestal, 1/5 total height of Order

#### PLATE 1.



Height of Plinth, ¼ height of Pedestal. Height of Pedestal Base, ½ height of Pedestal Plinth.

Height of Pedestal Cap, 1/2 height of Pedestal Plinth.

Projection of Cap and Plinth, 1/2 height of Pedestal Plinth.

Projection of Corona over Die, 34 projection

of Pedestal Cap.

Height of Column Base, ½ dameter of Column.

Projection of Base over Shaft, 1/2 semidiameter of Column.

**Pilasters.** The general proportions allotted to the columns of the Orders apply also to pilasters, which may be regarded as columns square on plan, but almost universally deeply engaged. The projection of pilasters must be Ιf regulated by circumstances. If impost mouldings or other projections stop upon them, as on the inner wall of an arcade, these projections must be sufficient to take the mouldings, and if they line with engaged columns crowned by an entablature, they must have a projection similar to the columns, and therefore in such cases never less than a semi-diameter. Apart from these

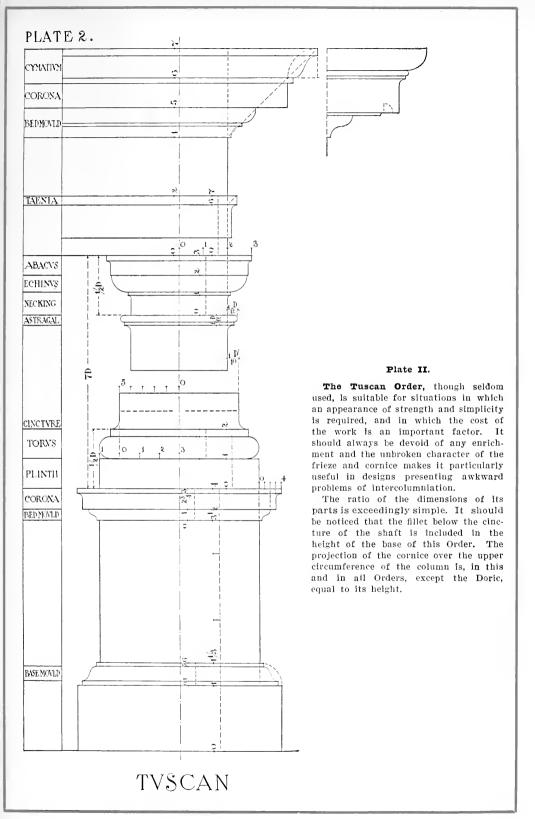
considerations, the projection should be about one-fourth of the diameter. Pilasters may be fluted or plain; if the former, the flutes should be, as far as possible, the same size as those of the adjoining columns, and always an odd number.

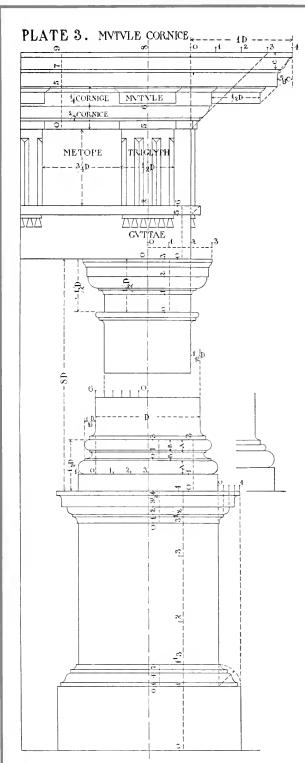
On plain faces 7 flutes (occasionally 9) are used, and therefore in the above case 4 flutes (or 5) would be employed on each side of the re-entering angle. The returned sides pilasters should never be fluted unless the projection is as much as half of a diame-The diameter assigned to a pilaster will ter. be that of a column (if any) used in conjunction with it. The shaft may or may not be diminished.

If the pilaster stand alone it is best formed with the same top and bottom diameter, but if a column stand in front of it then it should be diminished to the same extent as the column. Entasis is not usually given to pilasters.

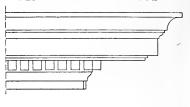
Unless columns and pilasters are monoliths the shafts should be built up of three drums and not two, as a central joint, unless exceptionally well executed, has a very disagreeable appearance.

	Dimension required	Ired.							Tuscan.	Doric.	fonic.	Corinthian.	Dimension = 1.
	No Pedestal Height of Entablature With Pedestal (Height of Entablature								-00 -00 -00	mic mic mic	elig elic elig	на на на	Total height of Order. "ight of Örder less Pedestal.
r	THE COLUMN. Diameter of Shaft Height of Base								mft- mes me	#2 mb #1	<b>H</b> S =0 =0	ng - w -dr	Height of Order less Entablature and Pedestal. Diameter of Shaft. Height of Base.
	". Lower Torus ". Upper Torus ". Upper Torus								.e.     .	ndru —	mp are en	z <sup>1</sup> 2 ας − 1	" less Plinth. " lower Torus.
	752 F								नामक सक	~:>-::1 -:1	To eye 3  Eye to abacus	<u> </u>	Diameter of Shatt. Height of Capital (Corinthian loss Abacus).
	" Abacus					٠				<del>-</del>	ma.	about 1 2nd leaf to abacus about 3	
	". Astragal and fillet Fillet below Astragal					٠.			ena enn	elo elti	1 1		Semi-diameter of Shaft. Height of Astragal and Fillet.
	Projection of Baso beyond Diameter .					•			-=	<del>-17 -1</del> 2	-07 F6	-:: -4::	Semi-diameter of Shatt.
	Diminution of Shaft at Top Projection of Cap over Shaft at Top. Cap over Shaft at Base Bead at top of Shaft .				· · · · ·				-10-10   Ho	intonin ( nto			Semi-diameter of Shaft at Top. Semi-diameter of Shaft.
۲,	TABL of Arc					•			(4-)	०वद न	e C	e, c	Height of Entablature.
	Frieze Cornice								to mer e	00000	, <u></u>	2-2	z z
	" Fillet and Cyma Corona and Fillet over						• •		40 A0	6 10 4	Lioth fillers 4	Hoth fillers &	" Cornice.
_	Base of Corona to top of Ovolo. Top of Ovolo to Frieze					٠.				च विक्		ic etc e	
_	Total projection of Architraye over top diam. of Shaft total projection of Architrave " "	am. o	f Sha	ij		• •			ntr nin	g (guttae)		er net i	Total projection of Architrave.
	of Cornice over Frieze	. 0								en soc			Height of Cornice. "Fillet and Cyma of Cornice.
	" Length of Modillions (or Mutules)								[]	ਤੂੰ (triglyph) ਤੂੰ	M. A. D. 1/2	Cand ogs el 3	Diameter of Columb.
	24 Space between Modiffions (or Dentils)	ils)					•	٠	1	(metope) 3	á		44
Τ,	THE PEDESTAL.					•	•	•	-17-	٠	~~~		jo.
	Base								सत्त त्या	45 m/r	e: -::	s (and filler)	" rinui. " Base.
	", tyma of Base Fillet below Cyma					•	•						oqu
_	" Cap						•		c+ C%	n =4	* -1	n -c	Cap.
_	Projection of Cap and Plinth over Die						• • •		n — n	N III (5"	* — 23		" Base of Pedestal. Projection of Cap over Die.





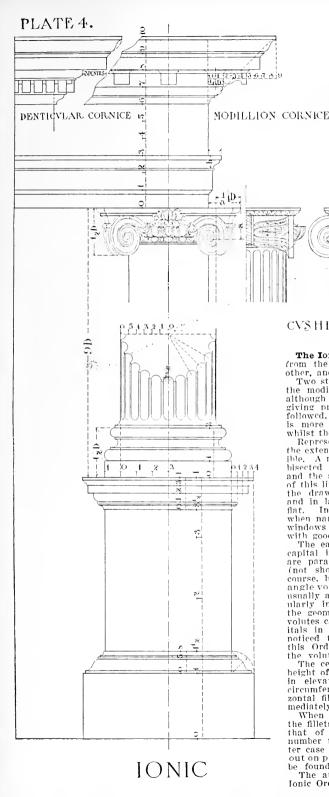
DENTICVLAR CORNICE



#### Plate III.

The Doric Order is always effective when used in lower storeys, arcades, and door and window openings, but owing to the triglyphs upon the frieze, which must fall centrally over the columns, it is the most difficult to deal with when spacing is in question.

The dimensions of the cornice do not lend themselves to any simple ratio and its projection is always greater than that adopted for the other Orders. The 45° line from the top of the frieze at once gives the bed mould of the mutule course, and one-third of the height of the cornice added to the top projection of this guiding line gives the total projection, while the mutules are one-half a diameter in side elevation. Some considerable modifications of the Order, as here represented, will be found to exist in many recognised examples. Occasionally the mutules are dispensed with, and their bed mould is cut to form a dentil course, as in the Theatre of Marcellus. The cyma crowning the cornice is often replaced by a cavetto, while the Doric base (shown alternatively on the plate) sometimes replaces the more graceful attic base. When this base is used, the upper fillet should be included in the height of the base, as in the Tuscan Order.



#### CVS HION CAPITAL

#### Plate IV.

The Ionic Order shows smaller variations from the pure Classic examples than any other, and its proportions are fairly simple.

Two styles of cornices are, however, used, the maillest are simple.

Two styles of cornices are, however, used, the modillion and the dentil cornice, and although the method adopted by Gibbs of giving prominence to the former has been followed, it should be stated that the latter is more generally found in old examples whilst the former is preferred by Palladlo.

Represented side by side upon the plate the extent of the variation is easily discernible. A modillion or dentil should always be bisected by the centre line of the column and the spacing determined by the distance and the spacing determined by the distance of this line from the frieze, as set out upon the drawing. The frieze is always plain and in larger works it is, preferably, kept flat. In smaller compositions, however, when narrow or when used over doors and windows a pulvinated frieze may be adopted with good effect.

The earlier alternative form of the Ionic capital in which the faces of the volutes capital in which the faces of the voluces are parallel to the plane of the elevation (not shown upon the drawings) may, of course, he substituted for the capital with angle volutes at 45°, though the latter has usually a much more graceful effect, particularly in small compositions. Of course, the geometrical method for setting out the rolutes cannot be used in drawing such canitals in ordinary elevation. It should he noticed that the height of the capital in this Order is measured from the soffit of the volutes.

The centre of the eye is one third of the The centre of the eye is observed of the capital from its bottom and is in elevation placed just outside the too circumference of the shaft, while the horizontal fillet at the top of the shaft is immediately below the eye.

When the column is fluted the width of the width of the column is fluted the width of the column is fluted the width of the width of the column is fluted the width of t

when the column is noted the width of the fillets should be one-fourth to one-third that of the flutes. The flutes generally number twenty or twenty-four; in the lat-ter case the simple method of setting them out on plan, as shown on the drawing, will be found of service.

The attic base is always used with the

Ionic Order.

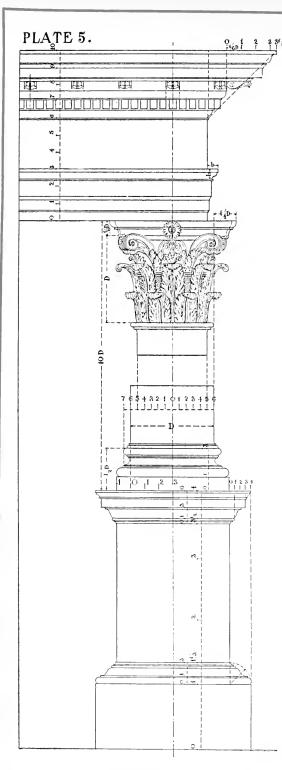


Plate V.

The Corinthian Order has been represented with considerable variations; from the original type.

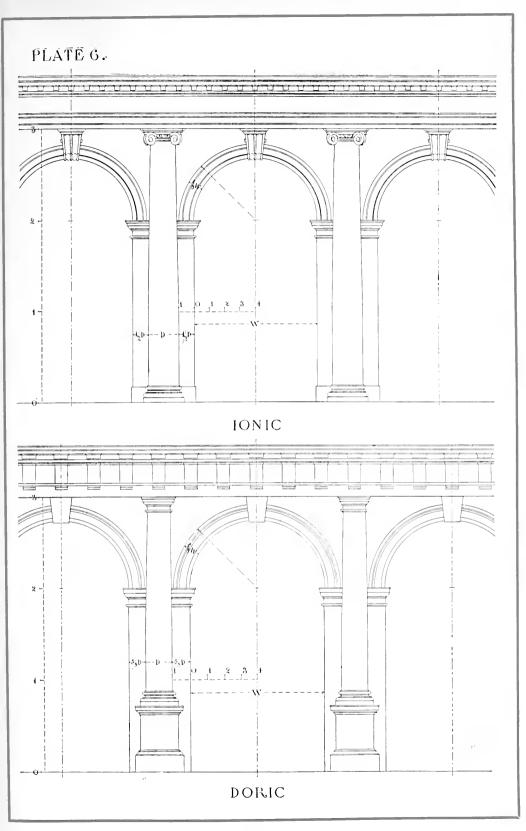
The Ionic entablature was often used by the ancients, supported by Corinthian columns, and the Corinthian cornice itself, though here represented with a dentil band, is often found without one. No general rule appears to exist for spacing the modillions or for their dimensions, the ratio of the width of the modillion to the space between two of them varying from 1:1½ to 1:2½, and again the number of the dentils between the modillions varies from 2 to 5 in different examples.

Both features should be symmetrically placed with reference to one another and to the centre line of the column, a point often neglected. To secure this result the following method is recommended:-Draw a modillion one-sixth of the dlameter of the column in width, arranged symmetrically over the centre line of the column. Place another with its outside edge three and a half times lts width within the total projection of the cornice. and thus obtain the spacing between the blocks. Divide the distance between two modillion centres into 15 parts, give two to a dentil, to be placed symmetrically under a modillion, and one to each space between the dentils, which will be found to bring the inside edge of the last dentil before the return, on the frieze line.

The form and projection of the leaves of the capital are largely matters of individual taste, but the general method of their arrangement will be evident after examining the drawing. It may, however, be noted that the eye of the volute is just outside the lower circumference of the shaft, and that the tiers of leaves divide the capital below the abacus into three approximate equal horizontal sections.

The column may or may not be fluted as in the Ionic Order.

The attic base, as used in the Ionic Order, is very generally employed—in fact, it is often preferable to adopt it, omitting the additional mouldings shown, for the sake of variety, on the drawling.



#### Plate VI.

The relations and dimensions given in this and similar subsequent plates must, therefore, be looked upon as necessarily somewhat elastic. At the same time, such dimensions as are given should not be disregarded, but considered in the light of proportions to be attained as far as the exigencies of the plan will admit.

The spacing of arcading dealt with in this plate should be governed by the height of the space to be treated, and it will be found that the best effects are obtained when the widths of the

seen that a relation exists between the diameter of the column, the width of the pllaster, and the width of the opening. Again, the diameter of the column relatively to the opening will be induced by the presence, or absence, of a pedestal to the Order. The summary shown, collected from Gibbs's work, giving the dimensions to be aimed at in order to comply with the above relations, will be found useful:

The height of the impost should always be about two-thirds of the height from the ground to the soffit of the architrave of the Order, whether a pedestal is in use or not.

#### Diameter of Column = 1.

	Tusca	ın.	Do	ric.	Io	nic.	Corint	hian.
Width of bay centre to center Width of one pilaster Width of opening	1/2	With 1'ed. 7 2/3 4 2/3		With Ped. 7½ 5½ 5¼		With Fed. 7½ 5/8 5¼		With Ped. 8 1/6 7-10 5 3/5

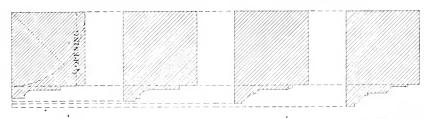
openings approximate to half of their height, and when the total width of the piers lies between one-half and two-thirds of that of the opening.

The spacing must also be considered in reference to the Order employed, so that when triglyphs, or modillions, are placed centrally over the columns their proper spacing may be interfered with as little as possible. It will thus be

The archivolt or moulding running round the arch should be the same width as the pilaster (less any necessary clearance for the mouldings)—that is, about one-eighth of the width of the opening, which should also be the height of the impost cap to the bottom of the necking. Further details as to the members will be found on Plate VII.

# PLATE 7.

#### IMPOSTS AND ARCH MOVLDS



TVSCAN

DORIC

TONIC

CORINTHIAN

## Plate VII. Impost Mouldings.

Details are here given of impost mouldings, with their archivolts, suitable for the different Orders. The divisions of the imposts are all simple and similar in each example, the height of the corona and of its mouldings above, if any, being equal to the height of the mouldings below, which, again, are equal to the necking. The bead and fillet below the necking are one sixth of the height of the impost, the bead being double the height of the fillet. The projection of the impost beyond the line of the pilaster is equal to the height of the corona and member over in the

first two Orders, while the projection of the corona itself is equal  $t_0$  this height in the last two.

The pilaster is square on plan, and, therefore, the plan of the archivolt is represented by this square upon which the mouldings are placed. An examination of these mouldings will show that they resemble the architraves given for their respective Orders, and their forms admit of similar variations. It will be noticed that the innermost face is always in the plane of the face of the pilaster, while the projection of the moulding at the extrados increases from about one-quarter the width of the whole archivolt in the Tuscan to one-third in the Corluthian Order.

## SUBJECT INDEX.

System of Classification for Filing Data, Drawings, Plates, Catalogues, Etc., in Architects' and Contractors' Offices.

#### INTRODUCTION.

The decimal system of classification was devised and elaborated by Mr. Melvil Dewey, formerly director of the New York State Library. This system was intended primarily for the use of librarians in the classification and arrangement of books and pamphlets, but it was soon found that the system furnished also a simple and effective means of classifying, indexing and filing literary matter of all kinds. Engineers have found it useful for indexing technical data and information, catalogs, reports, card systems, drawings, etc., and it has been found equally useful by reports, card systems, drawings,

etc., and it has been found equally useful by manufacturing and business concerns.

Much of the following information is taken from the University of Illinois Engineering Experiment Station, Bulletin No. 9, prepared by L. P. Breckenridge, Professor of Mechanical Engineering, and G. A. Goodenough, Associate Professor of Mechanical Engineering, and Bulletin No. 13 by N. Clifford Ricker, D. Arch. Professor of Architecture.

EXPLANATION OF THE DECIMAL SYSTEM.

The essential characteristic of the Dewey The essential characteristic of the Dewey System is its method of division and subdivision. The entire field of knowledge is divided into nine chief classes numbered by the digits from 1 to 9. Matter of too general a nature to be included in any of these classes is put into a tenth class and indicated by 0. The following are the primary classes of the Dewey System: the Dewey System:

GENERAL WORKS 0 PHILOSOPHY RELIGION SOCIOLOGY PHILOLOGY NATURAL SCIENCE USEFUL ARTS FINE ARTS LITERATURE HISTORY

Each of these classes is again divided into nine divisions, with a tenth division for general matter, and each division is separated into nine sections. The sections are again sub-divided and the process may be carried

sub-divided and the process may be carried as far as desired.

It is thought that this system will be especially valuable to architects for classifying drawings, catalogs, reports and technical data. Our space is too limited to publish the complete work, nor is it desirable. Should any one be sufficiently interested to go into the matter thoroughly, they should have Mr. Dewey's complete text on the subject. In order to make the application of the ject. In order to make the application of the system clear in the briefest possible way, the miscellaneous information contained in this book has been assumed to comprise a small architect's library and has been classified according to the Dewey System. It is fied according to the Dewey System. It is hoped that this will make clear the practical application to architects' libraries, both large and small. In succeeding years, we hope to be able to publish a more extensive relative index in which the items of the classification are arranged alphabetically, the one at present published only covering the items of miscellaneous information contained in this back with some of the more important general. book, with some of the more important general topics. We are particularly concerned as practitioners of the profession of architecture with divisions 6 and 7, "Useful Arts" and "Fine Arts," comprising the following

USEFUL ARTS 600 MEDICINE 610 ENGINEERING 620 630 640

subject numbers:

AGRICULTURE DOMESTIC ECONOMY COMMUNICATION AND COMMERCE. 650

CHEMICAL TECHNOLOGY 670 MANUFACTURES MECHANIC TRADES

033 690 BUILDING

Omitting all sub-divisions of this topic. with the exception of 690 "Building," we publish the sub-divisions of same. As distinguished from "Architectural Construction," guished from "Architectural Construction," "Building" has to do more particularly with the processes of construction and matters pertaining to trades and materials involved in the construction of buildings should be more properly classified under "Building", while matters as to types and component architectural parts are more properly classified under Architectural Construction. fied under Architectural Construction. 690

BUILDING - MATERIALS -TRADES.

See 721. for Architectural Construction, and 729. for Architectural Forms of Design. GENERAL.

.0 690.01 Biography of Builders. Finance of Buildings. .02 Operation of Buildings 0.3

THEORIES OF CONSTRUCTION. .1 .11

THEORIES OF CONSTRUCTION.
Systems of Construction.
Engineering of Construction.
SUMMARIES OR COMPENDS.
Manuals; .22, Handbooks.
Receipts, Collections of. .12.2 .21

.23 690.3 ALPHABETICALLY ARRANGED KNOWLEDGE.

Cyclopedias; .32, Dictionaries. DISSERTATIONS. .31 .4

.41 Lectures: .42. Discussions: .43. Essays. PERIODICALS. .5

Daily; .52, Weekly; .53, Monthly; .54, Quarterly; .55. Annual. .6 SOCIETIES; PROCEEDINGS.

.61 Trade Unions. Exhibitions. .62

.621Materials; .622, Methods; .623, Con-

struction. Contractors' Associations. Estimators' Clubs. .63

.631 Engineering Societies. Inspectors' Associations. .64 .65

.66 Material Dealers' Associations. Manufacturers' Associations. .67

Education and Study. Training of Workmen; .72, Apprenticeship; .73, Tools and Their Uses 690.7 (see special trade for special tools); .74, Shop Practice; .75, Trade Schools; .76, Manual Training.

690.8 Museums. .81

Museums.
Collections; .82, Patents; .83, Inventions; .84, Machines for Manufacturing; .841, Wood; .842, Stone; .843, Steel and Iron; .844, Bricks; .845, Tiles; .846, Cement and Lime; .847, Concrete; .848, Asphalt; .849, History of Building Materials.
Ancient; .92, Mediaeval; .93, Renaissance; .94, Modern; .95, History of Building Construction; .951, Ancient; .952, Mediaeval; .953, Renaissance; .954, Modern, .953, Renaissance; .954, Modern, .953, Renaissance; .954, Modern, .953, Renaissance; .954, Modern, .955, Machanals; Processes: Preservatives.

Materials; Processes; Preservatives. See 620.1 for Strength of Materials. See 693, to 699, for Uses of Prepared Materials. If the user prefers, he may classify all his material on 691. Building Engineering under 690.12.)

Woods. .1 .11 Hard Conifers. Soft Conifers. .12

Hard Leaf Woods.
Soft Leaf Woods.
Defects of Woods and Grading.
Injuries to Woods. 691.13 .14 .15

.16 Preservation of Woods. Stone; Material; Protection, .17

691 692 .29 Preservation. .19 Other General Drawings, Stone, Artificial; Concrete.

Beton Coignet; .32, Ransome; .33, Hollow Block; .34, Selenitic; .35, Lime Concrete; .36, Cement Concrete; .39, Aggregate. DETAIL DRAWINGS. .3 .2 .21 Masonry. .31 .22 Woodwork. Metal Work. SANITARY AND ILLUMINATING .23 .24 Ceramic Products. EQUIPMENT. 41 Bricks. .25 Heating and Ventilating. Plastering. .42 Tiles. .26 Roofing Composition.
Glass Work.
Other Drawings.
SPECIFICATIONS. .27 .432 Flooring. Wall Tiles. .441 .28 Other Drawings.

SPECIFICATIONS.

Title Page, General Conditions, Etc.;
301, Excavation and Grading; —02,
Mason Work, Fire Proofing and
Structural Concrete (See 693.); —03,
Cut Stone (See 693.); —04, Terra
Cotta (See 693.); —05, Concrete,
Walks and Floors (See 693.); —06,
Structural Iron; —061, Ornamental
Iron (See 694.9); —07, Fire Escapes
(See 694.927); —08, Carpenter Work
and Rough Hardware (See 694.1 to
5); —09, Cabinet Work (See 694.1)
—10, Sheet Metal Work, Slate and
Tile Roofing (including metal frames,
wire glass and skylights) (See
695.2); —11, Composition Roofing
(See 695.6 to 8); —12, Drainage, Sewcrage and Plumbing (See 696.1 to 6);
—13, Gas Fitting (See 696.7); —14,
Electric Wiring, Telephones, Bells,
and Speaking Tubes (See 696.91 to
9); —15, Electric Power Machinery;
—16, Power Equipment other than
Electrical; —17, Heating and Ventilation (See 697.1 to 9); —18, Pipe
Covering (See 697.46, also 691);
—19, Plastering, 1 Plain and 2 Ornamental (See 693.9); —20, Glazing,
1 Sheet Glass, 2 Plain Glass, 3
Mirrors (See 698.5); —21, Art Glass
(See 729.8, also 691.); —22, 1 Painting, 2 Varnishing, 3 Staining (See
698.); —23, Decoration of Walls,
Painted and Hung (See 698.); —24,
Tile, Mosaic and Marble (See 729.7);
—25, Mantels and Consoles (See
729.95 and 694.7); —26, Finish Hardware (See 698.42); —27, Elevators. .45 Hollow Structural Tiles. .29 .451 Floor. Roof and Ceiling Tiles.
Wall Tiles.
Wall Linings; .2, Bond Courses; .3, .452 .453 . 1 Partition. .46 Terra Cotta. Sewer Tiles. .48 .ŝ` CEMENTING MATERIAL. .51 .52 .53 Lime Cement. Asphaltum. Glue.
Other Cementing Materials.
GLASS, SHEET, PLATE, CATHEDRAL, OPALESCENT, PRISMATIC.
Iron; Steel; Anti-Rust Processes.
Cast Iron; .72, Malleable Cast Iron;
.73, Wrought Iron; .74, Steel, Blister
or Tool; .75, Steel, Crucible; .76,
Steel, Bessemer; .77, Open Hearth;
.79, Protection of Iron and Steel;
.791, Painting; .792, Tinning; .793,
Zincking (galvanizing); .794, Electroplating; .795, Bower-Barff Process; .796, Cement Coating; .797;
.798, .799.
Other Metals.
Copper. .54 Glue. .6 .71 .8 Copper. Nickel. .81 .82 .83 Zinc. .84 Lead. .85 Aluminum. Tin; .861, Tin-coated Iron. .86 .87 Silver. .88 Gold. Metallic Alloys; .891, Bell-Metal; .892, Brass; .893, Bronze. .89 25, Mantels and Consoles (See 729,95 and 694.7); -26, Finish Hard-ware (See (694.24); -27, Elevators, Dumb Waiters, Parcel Lifts and Con-OTHER MATERIALS. Fibriform; 1921, Hair; .2, Jute; .3, Hemp; .4, Flax; .5, Wool.

Paper; .931, Sheathing; .2, Quilt; .3, Slating; .4, Roofing; .5, Wall Paper; .6, Board. .92 Dumb Waiters, Parcel Lifts and Conveyors; —28, Gas Range (See 696.63); —29, Refrigerating Equipment (See 696.62); —30, Shades, Curtains and Hangings for Openings (See 729.97); —31, Carpets, Rugs, Etc.; —32, Screens (See 721.875); —33, Lighting Fixtures (See 729.99); —34, Furniture, including Seating, Tables, Desks, Etc. (See 729.92); —35, Organs (See 729.98); —36, Landscape Gardening (See 710.).

Contracts. Agreements. Bids. Ad-.93 Fabrics, Woven; .941, Duck; .2, Burlap and Buckram; .3, Carpet; .4, Rugs; .5, Linings; .6, Shades; .7, .94 Curtains and Hangings. Asbestos, Serpentine; 951, Asbestos Cloth; 2, Plaster; 3, Moulded Sections; 4, Fiber, Loose; 5, Asbestos Magnesia; 6, Asbestos Board; 7, Asbestos Shingles. .95 Agreements. Bids. Adbestos Shingles.
Bitumen; 961, Asphalt, Hard, Solid, Brittle; 2, Meltha or Mineral Tar; 3, Petroleum; 4, Naphthas.
Asphalt Products; 1, Paint; 2, Water-Proofing; 3, Cement; 4, Paving 5, Roofing Cement.
Coal-Tar; .6961, Pitch; .2, Roofing Cement; 3, Mill-Board; 4, Felt.
Wood-Tar; .6971, Pitch; .2, Resin; .3, Varnish; .4, Cement.
Felt; 1, Roofing; .2, Deafening, .3, Insulating. .4 vertisements. .96 Estimates. Quantities. Cost. By Cubical Contents. .5 .51 .52 By Square Foot Floor Area. By Trades or Units, divided as 692.3. .965 .53 Superintendence. .6 Supervision of Accounts.
Professional Services. Fees. Com-.966 8. missions.

Building Laws. Liabilities of the
Architect, Owner and Contractor.

State or General Laws. .967 .9 .97 Insulating. state or General Laws.
City Ordinances.
Town or Village Ordinances.
Trade Rules.
Liabilities of Architects.
Liabilities of Owners.
Liabilities of Contractors. Compositions; .981, Cork Carpet; .2, .98 .92 Linoleum. .93 .94 PLANS; SPECIFICATIONS; 692 .95ESTIMÁTES. .96 General Drawings; .10, Drafting .1 .97 Room Supplies. Lien Laws. Plan, Location; .12, Plan, Foundation; .13, Plans, Floor; .14, Plan, Roof; .15, Elevations; .151, Front; .152, Side; .153, Rear; .154, Court; .154 .98 .11 MASONRY, PLASTERING, 693 FIREPROOFING. Mortar .02 Solids .03 Metal. Stone Construction. .01 159 Sections; .161, Longitudinal; .162, Cross; .169, Special. .1 .16 Bond Stone Work.

693 694.3 STRENGTHENED BEAMS. POSTS, COLUMNS (See 721.31). PANELED AND LATTICED CON-STRUCTION, HALF TIMBER .12 Cutting and Dressing of Stone (See .4 515.8, Stereotomy; 736, Stone Carv-.5 ing) .21 .22 .3 Brick Construction. WORK. Bond of Brick Work.
Adobe or Sun Dried Brick.
Terra Cotta Construction.
Fire-proofing. Hollow Tile and Porous Terra Construction. JOINERY, GENERAL MILL WORK.
1, Frames; 2, Sash; 3, Doors, Panel,
Revolving and Rolling; 4, Blinds; 5,
Screens; 6, Trim; 7, Flooring. .4 Screens; 6, Trim; 7, Flooring.
ORNAMENTAL JOINERY, CABI-NET WORK.
1, Cabinets, Cases, etc. (See 729.9).
STAIR BUILDING (See 515.83 Ster-.5 Concrete and Beton or Sub-marine Construction. .51 Massive. .8 .52 eotomy). METAL WORK. Lavers. Layers. Hollow Blocks. Sidewalks; .541, Methods; .542, Vault Covers and Doors; .543, Vault .53 .54 .91 Structural. .911 Material (See 691.7). .912 Lights. .913 Wrought. .55 Ornamental. .6 Reinforced Concrete. .914 Rolled. Systems, arranged alphabetically. Forms and Centers. .915 Connections. .61 .62 .92 Ornamental. Testing and Inspection. ,921 Material (See 691). .63 Data from Experiments. .64 .922 .65 Formulas. .923 Wrought. Special applications.

Marble, Tile and Mosaic. Sanitary
Composition. Drawn. .66 .924 .7 .925 Guards and Grilles, Enclosures. .926 .71 .927 Fire-Escapes. Systems, arranged alphabetically, .8 Water-proofing. 694.928 Vault Doors. .81 Systems, arranged alphabetically. 695 SHEET, SHINGLE & COMPO-Plastering. External Plastering and Stucco. .9 COVERING, OVER-SITION .91 LAYING CONSTRUCTION. WOOD SHINGLES (See 694.1).
Sheet Metal and Allied Const.
Materials (See 691); .22, Specifications for (See 692.3-10); .23, Cost of (See 692.53-10). .92 Internal Plastering. .93 Ornamental Plastering. .94 Scagliola. .95 Wooden Lath. .96 Metal Lath and Furring. Studs, Cor-Mineral Wool Linings.
Plaster Board and Compo Board. .24 .241.97 Formed Sheet-metal. Moulded Work, Spun and Hammered Ornaments, Ventilator Caps and .98 FRAMED & BOXED CONSTRUCTION, CARPENTRY & 694 Ducts Utensils, Cans, etc. Sky-light bars. Window Frames and Sash, Sheet Metal Doors, Hinged, Rolling and .242 .242 METAL WORK. .243 WOOD CONSTRUCTION IN GENERAL, INC. PAPER BOARD. .1 Sliding. .11 Ordinary. Glass for Sky-lights and Fire-proof .244 Balloon Const. for Frame Buildings. Joist Const. for Masonry Buildings. .111 Windows. .112 Shingles of Metal, Slate or Compo-Heavy Timber Construction.
Heavy Post and Timber Const. for Frame Buildings. .12 sition. .121 251 Kinds of, arranged alphabetically. .252 Tests, Sizes, Preservatives. Tile of Metal, Slate, Terra Cotta or Mill Const. for Masonry Buildings.
Auxiliary Wood Const. for Fire-proof .122 .26 .13 Composition. Buildings. 261 Kinds of, arranged alphabetically. Corrugated and Stamped Metal Roof-.131 Centering, Forms, Protective Cov-.27 ering. ing and Siding. Grounds, Attachment Strips, etc.
JOINTS OF WOOD-WORK, FRAMING, ATTACHMENTS. .132 .28 .2 Wood-Pins; 2, Tenons; 3, Mortise; 4, Dove-tail; 5, Splice, etc. Glue, Cement, etc.
Metal Formed Joints, Concealed .3 STAMPED METAL WALL AND .21 **CEILING DECORATIONS.**Kinds of, arranged alphabetically. .31 .22 .4 Sheet Metal Trim. and Furniture. .23 .5 Rough Hardware. COMPOSITION. .6 .231 Nails, Spikes. Nails, Spikes.
1, Bolts and Rods; 2, Rivets; 3, Washers, Flitch-plates; 4, Stirrups, Anchors, Hangers, Ties, Box and Wall Anchors and Plates, etc.; 5, Coal Chutes. Metal Chimney Caps.
1, Pivots; 2, Hinges; 3, Pulleys; 4, Cords and Chains; 5, Weights, etc.; 6, Door Hangers; 7, Turn Tables.
Exposed Metal-formed Joints and Protections. Finish Hardware .61 Asphalt; 2, Tar; 3, Concrete, .232 Melted. Alerted.
1, Felt; 2, Asbestos; 3, Paper; 4, Mineral Wool; 5, Canvas.
DEAFENING FELTS AND QUILTS.
TEXTILE DUCK, CANVAS, BUR-.62 .8 .233 LAP THATCH AND OTHER COVER-9. INGS. .24 SANITARY EQUIPMENT, IL-696 Protections, Finish Hardware. Hinges, But Locks, Latches, .241 LUMINATION (Drainage, Sewerage, Plumbing, Gas-Fitting, Key-plates, Kick-plates, Pulls, Sock-Electric Lighting). ets, Lifts, etc. Bumpers, Strikes, Angle Covers, Holders, etc. Weather Strips, Thresholds, Treads for Stairs. Closing Mechanism Springs, Spring-DRAINAGE .242 .2 .21 .22 Strips, SEWERAGE. Sewer Pipe. Catch Basins. .243 .23 Garbage Disposal. Soil and Waste Pipe. PLUMBING. checks, etc. .24 .244 Step-ladders. .3 Carriers of Merchandise. .245 .4 WATER SUPPLY. .246 .41 Cold Water. .247 .411 Pumps .248 Show Cases. Windmills. .249

696. <sup>413</sup>	Tanks; 4, Hose; 5, Fire Protection; 6, Filters; 7, Sterilizers; 8, Ice Machinery; 9, Stills, etc.	702 703	UTILITY. AESTHETICS. COMPENDS. OUTLINES. DICTIONARIES. CYCLOPEDIAS.
.42 .421	Hot Water. Roilers Tanks.	704 705	ESSAYS. LECTURES. ADDRESSES. PERIODICALS. MAGAZINES. RE-
.422 .5	Heaters, Coal, Gas, Garbage Burners.  JOINTS. ANCHORS. SUPPORTS.	706	VIEWS. SOCIETIES. TRANSACTIONS. RE-
.6	FIXTURES FOR PLUMBING. Water Closets, Lavatories, Sinks,	707	PORTS, ETC. EDUCATION. STUDY AND TEACH- ING OF ART.
.61 .62	Wash-trays, Baths, etc.	708 .1	ART GALLERIES AND MUSEUMS. American. Corcoran, Metropolitan,
.63 .64	Refrigerators, Water Coolers. Gas Ranges, Clothes Dryers. Brass Goods.		Boston, .2 English, National,
.7	GAS FITTING (for fixtures, see 729.99).		Hampton Court, Windsor3 German. Dresden, Munich, Berlin, Vienna4 French. Louvre, Luxem-
.8	OTHER BRANCHES. PNEUMATIC CLEANING.		bourg5 Italian. Vatican, Sistine, Pitti, Medici, Borbonico6 Spanish.
.9	ELECTRIC EQUIPMENT FOR IL- LUMINATION, COMMUNICATION AND POWER PROTECTION.		Madrid, Seville7 Russian. St. Petersburg, Hermitage8 Scandinavian. Copenhagen9 Other Coun-
.91	Kinds of Conduit, arranged alpha- betically.	709	tries. HISTORY OF ART IN GENERAL.
.92	Wire: 1, Gauges; 2, Kinds.		Divided like 930-999.
.93 .94	Insulation. Switch-boards; 2, Switches; 3, Cut-	710	LANDSCAPE GARDENING.
	outs; 4, Transformers; 5, Sockets,	711	PUBLIC PARKS.
	Receptacles, Rosettes.	712	PRIVATE GROUNDS. LAWNS.
.95	1, Bells; 2, Speaking Tutes; 3, Telephones; 4, Batteries; 5, Letter Boxes.	713 714	WALKS. DRIVES. BRIDGES. WATER. FOUNTAINS. LAKES.
.96	1, Burglar Alarms; 2, Door Openers; 3, Lightning Rods; 4, Other	715	TREES. HEDGES. SHRUBS. See also 634.9, Forestry; 582, Bot-
.97	Branches. Fixtures (See 729.99).	716	any. PLANTS. FLOWERS.
.98	Power Machinery.	716	.1, Plants; .2, Flowers; .3, Conserva-
.99	Laws. Company Restrictions, etc.		tories; .4, Window gardens; .5, Fern-
697	HEATING AND VENTILA-		eries.
	TION. (Steam and Water Fit-	717	ARBORS. SEATS. OUTLOOKS.
	ting.)	718 719	MONUMENTS. MAUSOLEUMS. CEMETERIES. See also 393.1, Earth
.1	FIRE PLACES. Dampers and Ash	113	burial; 614.61, Public health.
	Drops, Trimmings.	720	ARCHITECTURE.
.2	STOVES.	.1	Theories, Esthetics, Architectonics;
.3	FURNACES. HOT WATER AND STEAM.		.2, Compends, Manuals; .3, Diction-
.4 .41	Hot Water; 1, Low Pressure; 2, High.		aries, Cyclopedias; .4, Essays, Lec-
.42	Steam; 1, Low Pressure; 2, High; 3,		tures; .5, Periodicals; .6, Societies;
	Vacuum.		.7, Education, Study, Training,
.43	Boilers; 1, Steel Water Tube; 2, Steel Flue Tube; 3, Cast-iron Sec-		Schools of Architecture; .8, Poly-
	tional; 4, Grates; 5, Setting.		graphy, Collections; .9, General History of Architecture, divided geogra
.44	1, Valves; 2, Pipes; 3, Regulators;		ically like 940-999.
	4, Trimmings for Boilers; 5, Ther-	721	ARCHITECTURAL CONSTRUC-
45	mometers.	.1	TION. Foundations. See Bridge Engineer-
.45 .46	Radiation, arranged alphabetically.  Pipe Covering.	.1	ing, 624.1, Foundations.
.5	ELECTRIC AND OTHER	.2	Walls, Partitions, etc.
	METHODS.	.3	Piers. Columns.
.6	LAUNDRY MACHINERY.	.4 721.5	Arched Constructions.
.7	CLOTHES DRYERS. FUELS. Fuel Handling Machinery.	.6	Roofs. See 695, Roof Coverings; Floors and Flooring. See 620.8.
.8	SMOKE FLUES. SMOKE PREVEN-	.7	Ceilings.
	TION.	.8	DOORS. ENCLOSURES. WIN-
.9	<b>VENTILATION.</b> 1, Air Ducts; 2, Conduits; 3, Registers; 4, Fans.	.81	DOWS. Doors, Wood.
698	PROTECTIVE, PRESERVA-	.82	Doors, Metal.
090	TIVE AND DECORATIVE	.821	Single; .822, Double; .823, Sliding; .824, Concealed; .825, Fire-proof; .826.
			.824, Concealed; .825, Fire-proof; .826.
	COVERING. (Painting, Wall-		Sheet Metal on Wood; .827, Wire- glazed; .828, Vault; .829.
	Hanging, Glazing, Floor Cover-	.84	Windows, External.
	ing).	.85	Windows, Internal.
.1	Painting; .11, Oil; .12, Cold-water; .13. Stains Ext.: .14, Enamel Ext.	.86	Architectural Treatment of Doors
.2	Distemper and Fresco.	.87	and Windows. Shutters. Blinds. Screens. Grilles.
.3	1, Varnishing; 2, Polishing Wax; 3,	.871	Shutters, Blinds, Screens, Grilles. Shutters, Wood; .872, Shutters, Steel;
4	Staining; 4, Enamel. Other Modes of Protection.		.873, Blinds, Ordinary; .874, Blinds, Venetian: .875, Screens, Insect.
.4 .5	Glazing, See 748, Stained Glass.	.876	Venetian: .875, Screens, Insect. Grilles, Wood.
.0	1 Stained Glass: .2. Plate Glass;	.877	Grilles, Ornamental, Metal (See
	.3, Ornamental Glass; .4, Prisms; .5,		694.92).
_	Mirrors.		Window and Door Guards.
.6	Paper-hanging. Textile Hangings. Tapestry.		Stair Railings.
.7 .8	Relief Work. Lincrusta. Stamped	.8773	Elevator Enclosures.  Office Enclosures.
	Leather, etc.	.88	Fastenings, Locks (See 694.24).
.9	Other branches. Carpets, Curtains and Rugs, Rubber Matting and Tile.	.89	Other Fixtures.
699	CAR AND SHIP BUILDING.	.9	Iron and Composite Structures. See 620.1 for Strength of Materials.
	FINE ARTS.		Classify here only that which cannot
/00 7 <b>01</b>	PHILOSOPHY. THEORIES.		be placed elsewhere, under 721, etc.

nai .	- + d	# COP	7 73.3
721.91	Cast-Iron Structures; .92, Wrought- Iron Structures; .93, Steel Struc-	725	- 11
	Iron Structures; .93, Steel Struc-	.184	National Police Buildings.
	tures; .94, Composite Structures; .95,	.185	State Police Buildings.
	Steel and Wood; .96, Steel and	.186	City Police Buildings.
	Steel and Ceramic; .971,	.19	Engine Houses. Fire Alarm Sta-
	Steel and Brick; .972, Steel and Tile;		tions.
	.973, Steel and Terra Cotta; .98, Steel and Glass; .99, Wood and	.2	Business and Commercial.
	Glass.	.21	Stores, Wholesale and Retail.
		.22	Mixed Store, Office, and Apartment
722, 723,	724 HISTORY OF ARCHITECTURE.	2.0	Buildings.
	Classify modern American buildings	.23	Office Buildings. Telegraph. Insur-
	of importance in the History of	0.4	ance. Loft.
	Architecture under 724; generally all other American buildings under 725	$.24 \\ .25$	Banks. Safe Deposit. Savings.
	to 728 inclusive.	.26	Exchanges. Boards of Trade. Markets.
	Modern foreign buildings are usually	.27	Cattle Markets. Stock Yards.
	placed under 724, unless of special	.28	Abattoirs.
	importance as examples of the class	.29	Other Business Buildings.
	or purpose, when they are to be	.3	Transportation and Storage.
	or purpose, when they are to be treated like American buildings.	.31	Railway Passenger Stations.
722.	ANCIENT OR PRIMITIVE ARCHI-	.311	Small (country) Stations,
166.	TECTURE.	.312	Large (city) Stations.
.0	Prehistoric.	.313	Union Stations.
.02	England.	.314	Stations on two levels.
.04	France.	.315	
.07	Russia.	.316	
.08	Scandinavia.	.317	Street-car Stations.
722.11	China.	.318	Elevated R. R. Stations.
.12	Japan.	.319	Underground R. R. Stations.
.13	Korea.	.32	Railway Freight Houses.
.14	Philippine.	.33	Railway Shops, Round Houses, Car Houses, Tanks, Stores.
722.2	Egypt.	0.4	Houses, Tanks, Stores.
.3	Phoenician, Jewish, etc.	.34	Dock Buildings. Wharf Boats and Houses.
.4	India, East.	9.5	
.5 .7	Western Asia. Roman.	.35	1, Warehouses; 2, Cold Storage; 3,
.8	Grecian.	.36	Safe Deposit Storage. Elevators, Grain.
.9	Other Ancient Styles.	.37	Bievators, Grain.
		.38	
723.	MEDIAEVAL, CHRISTIAN, MO- HAMMEDAN.	.39	Other.
.1	Early Christian.	.4	Manufactories.
.2	Byzantine.	.41	Textile Factories or Mills. Wool,
723.3	Mohammedan.		Cotton, Silk.
.4	Romanesque.	.42	Breweries. Malteries. Distilleries.
723.5	Gothic.	.43	Foundries. Machine Shops. Iron
	MODERN.		and Steel Works.
<b>724.</b> .1	Panaissance: 111 Scotland: 115.	.44	Wood-working Mills, Furniture Fac-
.1	Panaissance: 111 Scotland: 115.		Wood-working Mills. Furniture Factories.
	Panaissance: 111 Scotland: 115.	.45	Wood-working Mills. Furniture Factories. Carriage and Car Factories.
	Panaissance: 111 Scotland: 115.	$\begin{smallmatrix} .45\\ .46\end{smallmatrix}$	Wood-working Mills. Furniture Fac- tories. Carriage and Car Factories. Paper Mills.
	Renaissance; .111, Scotland; .115, Ireland; .12, England; .121, Lilizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France;	.45 .46 .47	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc.
	Renaissance; .111, Scotland; .115, Ireland; .12, England; .121, Lilzabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France; .141, Francis I; .142, Henry IV; .143,	$\begin{smallmatrix} .45\\ .46\end{smallmatrix}$	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick
	Renaissance; .111, Scotland; .115, Ireland; .12, England; .121, Elizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France; .141, Francis I; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145,	.45 .46 .47 .48	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works.
	Renaissance; .111. Scotland; .115. Ireland; .122. England; .121. Lelizabethan; .122. Jacobean; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141, Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. Cinque-	.45 .46 .47 .48	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France; .141, Francis I; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145, Empire; .724.15, Italy; .151, Cinquecento; .152, High Renaissance; .153,	.45 .46 .47 .48	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152, High Renaissance; .153. Decadence; .154. Rococo; .16, Spain; .169. Portugal; .17. Russia;	.45 .46 .47 .48 .49	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152, High Renaissance; .153. Decadence; .154. Rococo; .16, Spain; .169. Portugal; .17. Russia;	.45 .46 .47 .48	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152, High Renaissance; .153. Decadence; .154. Rococo; .16, Spain; .169. Portugal; .17. Russia;	.45 .46 .47 .48 .49 <b>725.5</b>	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141, Francis I; .142, Henry IV; .143. Louis XIV; .144, Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152, High Renaissance; .153, Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South Amer-	.45 .46 .47 .48 .49 <b>725.5</b> .51	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane.
	Renaissance; .111. Scotland; .115. lreland; .12, England; .121. Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France; .141, France; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145, Empire; 724.15, Italy; .151. Cinquecento; .152, High Renaissance; .153, Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili;	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded.
	Renaissance; .111. Scotland; .115. Ireland; .122. England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14. France; .141, Franceis I; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145. Empire; 724.15, Italy; .151, cinquecento; .152, High Renaissance; .153, Decadence; .154, Roccoc; .16, Spain; .169, Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7,	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Franceis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; .724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scand-	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded.
	Renaissance; 111, Scotland; 115, Ireland; 122, England; 121, Lilizabethan; 122, Jacobean; 123, 17th Century; 124, 18th Century; 13, Germany; 136, Austria; 14, France; 141, Francis I; 142, Henry IV; 143, Louis XIV; 144, Louis XVI; 145, Empire; 724.15, Italy; 151, Cinquecento; 152, High Renaissance; 153, Decadence: 154, Roccoc; 16, Spain; 169, Portugal; 17, Russia; 171, Canada; 172, Mexico; 173, United States; 1, Old Colonial; 2, Spanish Colonial; 178, South America; 1, Brazil; 2, Argentina; 3, Chili; 4, Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela: 9, Paraguay; 18, Scandinavia; 181, Norway; 185, Sweden;	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans.
	Renaissance; 111. Scotland; 115. Ireland; 122. England; 121. Lelizabethan; 122. Jacobean; 123, 17th Century; 124, 18th Century; 13, Germany; 136. Austria; 14, France; 141, Francis I; 142, Henry IV; 143. Louis XIV; 144. Louis XVI; 145. Empire; 724.15, Italy; 151. Cinquecento; 152, High Renaissance; 153. Decadence: 154, Rococo; 16, Spain; 169. Portugal; 17, Russia; 171. Canada; 172. Mexico; 173. United States; 1, Old Colonial; 2, Spanish Colonial; 178, South America; 1, Brazil; 2, Argentina; 3, Chili; 4, Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela; 9, Paraguay; 18, Scandinavia; 181, Norway; 185, Sweden; 189, Denmark; 19, Minor Countries;	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling.
	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; .724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185, Sweden; .189, Denmark; .19, Minor Countries; .192, Holland; .193, Belgium; .194.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans.
.1	Renaissance; 111. Scotland; 115. Ireland; 122. England; 121. Lelizabethan; 122. England; 123. 17th Century; 124. 18th Century; 13. Germany; 136. Austria; 14. France; 141. Franceis I; 142. Henry IV; 143. Louis XIV; 144. Louis XVI; 145. Empire; 724.15, Italy; 151. Cinquecento; 152. High Renaissance; 153. Decadence: 154. Roccoci 16, Spain; 169. Portugal; 17, Russia; 171. Canada; 172. Mexico; 173. United States; 1, Old Colonial; 2. Spanish Colonial; 178. South America; 1, Brazil; 2. Argentina; 3. Chili; 4. Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela: 9, Paraguay; 185. Seandinavia; 181. Norway; 185. Sweden; 189. Holland; 193. Belgium; 194. Switzerland; 199.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.
.1	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14, France; .141. Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; .724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171, Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185, Sweden; .189, Denmark; .19, Minor Countries; .192, Holland; .193, Belgium; .194.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.
.1	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence; .154. Roccoc; .16. Spain; .169. Portugal; .17. Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses.
.1 .2 .3	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121, Lelizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136, Austria; .14, France; .141, Francis I; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145, Empire; 724.15, Italy; .151, Cinquecento; .152, High Renaissance; .153, Decadence; .154, Rococo; .16, Spain; .169, Portugal; .17, Russia; .171, Canada; .172, Mexico; .173, United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181, Norway; .185, Sweden; .189, Denmark; .19 Minor Countries; .192, Holland; .193, Belgium; .194, Switzerland; .199, Classical Revival. Grecian. Gothic Revival.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses
.2 .3 .4 .5 724.6	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. Jacobean; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Roccoc; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2. Argentina; .3, Chili; .4. Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Tudor Gothic Revival. Neo Grec.	.45 .46 .47 .48 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction.
.2 .3 .4 .5 724.6	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14. France; .141, Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172, Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; 4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185. Sweden; .189, Denmark; .19, Minor Countries; .192. Holland; .193, Belgium; .194, Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Neo Grec.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .556 .57 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools.
.2 .3 .4 .5 724.6 .7	Renaissance; 111, Scotland; 115, Ireland; 122, England; 121, Islizabethan; 122, Jacobean; 123, 17th Century; 124, 18th Century; 13, Germany; 136, Austria; 14, France; 141, Francis I; 142, Henry IV; 143, Louis XIV; 144, Louis XVI; 145, Empire; 724.15, Italy; 151, Cinquecento; 152, High Renaissance; 153, Decadence: 154, Rococo; 16, Spain; 169, Portugal; 17, Russia; 171, Canada; 172, Mexico; 173, United States; 1, Old Colonial; 2, Spanish Colonial; 178, South America; 1, Brazil; 2, Argentina; 3, Chili; 4, Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela: 9, Paraguay; 18, Scandinavia; 181, Norway; 185, Sweden; 189, Denmark; 19, Minor Countries; 192, Holland; 193, Belgium; 194, Switzerland; 199, Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival.	.45 .46 .47 .48 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate
.2 .3 .4 .5 724.6 .7 .8	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Islizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence: .154. Roccoci .16. Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2. Argentina; .3. Chili; .4. Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19. Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles.	.45 .46 .47 .48 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums.
.2 .3 .4 .5 724.6 .7 .8 .9	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14. France; .141, Francis I; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154, Rococo; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; 1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; 4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185. Sweden; .189, Denmark; .19, Minor Countries; .192. Holland; .193, Belgium; .194, Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Recognic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refershment. Baths. Parks.
.2 .3 .4 .5 724.6 .7 .8 .9	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Francis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence; .154. Rococo; .16. Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19, Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Neo Grec. Haff-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitals. Houses of Parliament.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Francis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence; .154. Rococo; .16. Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19, Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Neo Grec. Haff-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitals. Houses of Parliament.	.45 .46 .47 .48 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .59 .61 .62 .63 .64 .65	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11	Renaissance; 111, Scotland; 115, Ireland; 122, England; 121, Lilizabethan; 122, Jacobean; 123, 17th Century; 124, 18th Century; 13, Germany; 136, Austria; 14, France; 141, Francis I; 142, Henry IV; 143, Louis XIV; 144, Louis XVI; 145, Empire; 724.15, Italy; 151, Cinquecento; 152, High Renaissance; 153, Decadence: 154, Rococo; 16, Spain; 169, Portugal; 17, Russia; 171, Canada; 172, Mexico; 173, United States; 1, Old Colonial; 2, Spanish Colonial; 178, South America; 1, Brazil; 2, Argentina; 3, Chili; 4, Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela: 9, Paraguay; 18, Scandinavia; 181, Norway; 185, Sweden; 189, Denmark; 19, Minor Countries; 192, Holland; 193, Belgium; 194, Switzerland; 199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .57 .58 .59 .61 .62 .63	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish,
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13, Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Roccoc: .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; 1, Old Colonial; .2. Spanish Colonial; .178. South America; .1, Brazil; .2. Argentina; .3, Chili; .4. Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19. Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Grecian. Gothic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence; .154. Roccoc; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185. Sweden; .189, Holland; .193, Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .556 .57 .58 .61 .62 .63 .64 .65	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11	Renaissance; .111. Scotland; .115. Ireland; .12, England; .121. Lelizabethan; .122. England; .123. 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152. High Renaissance; .153. Decadence; .154. Roccoo; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178. South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189, Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Bonded Warebouses. Excise Offices.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas,
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Islizabethan; .122. Jacobean; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Francis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Rococo; .16. Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1. Old Colonial; .2. Spanish Colonial; .178. South America; .1. Brazil; .2. Argentina; .3. Chili; .4. Bolivia; .5. Peru; .6. Ecuador; .7. Venezuela: .9. Paraguay; .18. Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19. Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Court Houses. Excise Offices.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65 .71 .72 .73	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc.
.2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13, Germany; .136. Austria; .14. France; .141. Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Roccoc: .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; 1, Old Colonial; .2. Spanish Colonial; .173. South America; .1, Brazil; .2. Argentina; .3, Chili; .4. Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19. Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Grecian. Gothic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols: Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Record Offices. Court Houses. Record Offices. Post Offices. General and Special.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .556 .57 .58 .61 .62 .63 .64 .65	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Islizabethan; .122. Jacobean; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Francis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Rococo; .16. Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1. Old Colonial; .2. Spanish Colonial; .178. South America; .1. Brazil; .2. Argentina; .3. Chili; .4. Bolivia; .5. Peru; .6. Ecuador; .7. Venezuela: .9. Paraguay; .18. Scandinavia; .181. Norway; .185. Sweden; .189. Denmark; .19. Minor Countries; .192. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Court Houses. Excise Offices.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65 .71 .72 .73	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations.
.1 .2 .3 .4 .5 .724.6 .7 .8 .9 .725 .11 .12 .13 .14	Renaissance; 111, Scotland; 115, Ireland; 122, England; 121, Lilizabethan; 122, Jacobean; 123, 17th Century; 124, 18th Century; 13, Germany; 136, Austria; 14, France; 141, Francis I; 142, Henry IV; 143, Louis XIV; 144, Louis XVI; 145, Empire; 724.15, Italy; 151, Cinquecento; 152, High Renaissance; 153, Decadence: 154, Rococo; 16, Spain; 169, Portugal; 17, Russia; 171, Canada; 172, Mexico; 173, United States; 1, Old Colonial; 2, Spanish Colonial; 178, South America; 1, Brazil; 2, Argentina; 3, Chili; 4, Bolivia; 5, Peru; 6, Ecuador; 7, Venezuela: 9, Paraguay; 18, Scandinavia; 181, Norway; 185, Sweden; 189, Denmark; 19, Minor Countries; 192, Holland; 193, Belgium; 194, Switzerland; 199, Classical Revival. Grecian. Gothic Revival. Queen Anne Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Court Houses. Record Offices. Post Offices. Post Offices. Post Offices. Post Offices. Post Offices. Palaces of Rulers.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .534 .555 .567 .589 .61 .623 .64 .65 .71 .723 .73	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations. Recreation.
.1 .2 .3 .4 .5 .724.6 .7 .8 .9 .725 .11 .12 .13 .14	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Islizabethan; .122. England; .123. 17th Century; .124. 18th Century; .13, Germany; .136. Austria; .14. France; .141, Franceis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Roccoc; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; 1, Old Colonial; .2, Spanish Colonial; .173. South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181, Norway; .185, Sweden; .189, Denmark; .19, Minor Gountries; .192, Holland; .193, Belgium; .194, Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Coher Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Record Offices. Court Houses. Record Offices. Post Offices General and Special. Official Residences. Palaces of Rulers.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .556 .57 .58 .61 .62 .63 .64 .65 .71 .72 .73 .74 .75 .76	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations. Recreation. Music Halls.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13 .14 .15 .16 .17	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14. France; .141, France; .141, France; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154. Roccoc; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181, Norway; .185. Sweden; .189, Holland; .193, Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Bonded Warehouses. Excise Offices. Court Houses, Record Offices. Post Offices General and Special. Official Residences. Palaces of Rulers. Barracks. Armories. Police Stations.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65 .77 .71 .72 .73 .74 .75	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations. Recreation. Music Halls. Auditoriums.
.1 .2 .3 .4 .5 .724.6 .7 .8 .9 .725 .1 .11 .12 .13 .14 .15 .16 .17	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Islizabethan; .122. Jacobean; .123. 17th Century; .124. 18th Century; .13. Germany; .136. Austria; .14. France; .141. Francis I; .142. Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15. Italy; .151. Cinquecento; .152. High Renaissance; .153. Decadence: .154. Rococo; .16. Spain; .169. Portugal; .17. Russia; .171. Canada; .172. Mexico; .173. United States; .1. Old Colonial; .2. Spanish Colonial; .173. South America; .1, Brazil; .2. Argentina; .3. Chili; .4. Bolivia; .5. Peru; .6. Ecuador; .7. Venezuela; .9. Paraguay; .18. Scandinavia; .181. Norway; .185. Sweden; .189. Holland; .193. Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministraitos of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Excise Offices. Post Offices. Post Offices. General and Special. Official Residences. Palaces of Rulers. Barracks. Armories. Police Stations. National Barracks.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65 .71 .72 .73 .74 .75 .76	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations. Recreation. Music Halls. Auditoriums. Theatres. Opera Houses.
.1 .2 .3 .4 .5 724.6 .7 .8 .9 725 .1 .11 .12 .13 .14 .15 .16 .17	Renaissance; .111. Scotland; .115. Ireland; .12. England; .121. Lelizabethan; .122. Jacobean; .123, 17th Century; .124, 18th Century; .13, Germany; .136. Austria; .14. France; .141, France; .141, France; .142, Henry IV; .143. Louis XIV; .144. Louis XVI; .145. Empire; 724.15, Italy; .151. cinquecento; .152, High Renaissance; .153. Decadence; .154. Roccoc; .16, Spain; .169. Portugal; .17, Russia; .171. Canada; .172. Mexico; .173. United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela: .9, Paraguay; .18, Scandinavia; .181, Norway; .185. Sweden; .189, Holland; .193, Belgium; .194. Switzerland; .199. Classical Revival. Grecian. Gothic Revival. Tudor Gothic Revival. Queen Anne Revival. Neo Grec. Half-Timber Swiss. Romanesque Revival. Other Recent Styles. PUBLIC BUILDINGS. Administrative. Governmental. Capitols. Houses of Parliament. Ministries of War, State, etc. City and Town Halls. Bureaus. Public Offices. City Plans. Custom Houses. Bonded Warehouses. Excise Offices. Court Houses, Record Offices. Post Offices General and Special. Official Residences. Palaces of Rulers. Barracks. Armories. Police Stations.	.45 .46 .47 .48 .49 <b>725.5</b> .51 .52 .53 .54 .55 .56 .57 .58 .59 .61 .62 .63 .64 .65 .77 .71 .72 .73 .74 .75	Wood-working Mills. Furniture Factories. Carriage and Car Factories. Paper Mills. Mills for Flour, Meal, Feed, etc. Pottery, Glass, Terra Cotta, Brick Works. Other Manufactories.  Hospitals and Asylums. See also 725.6. Reformatories. Sick and Wounded. Eye and Ear. Incurables. Lying-in. Insane. Idiotic. Feeble-minded. Blind. Deaf and Dumb. Paupers. Almshouses. Aged. Children. Orphans. Foundling. Soldiers' Homes.  Prisons and Reformatories. State Prisons. Penitentiaries. Jails. Cell Houses. Reformatories for Adults. Houses of Correction. Reform Schools. Washingtonian Homes. Inebriate Asylums. Refreshment. Baths. Parks. Cafés. Restaurants. Saloons. Baths: Warm, Medicated, Turkish, Russian. Swimming Baths. Buildings for Watering Places, Spas, etc. Buildings for Parks and Streets. Public Comfort Stations. Recreation. Music Halls. Auditoriums.

725		728 <sub>.66</sub>	All wood, 1, less than 7 rooms; 2,
.85	Gymnasiums. Turn Halls.		7-12 rm; 3, 13 rm or over.
.86	Skating Rinks. Bicycle Rinks.	.67	Farm Houses.
.87	Boat Houses, Bath Houses,	.68	Laborers' Cottages. 1, Frame; 2,
.88 .89	Riding Halls and Schools. Shooting Galleries.	.7	Masonry. Seaside and Mountain Cottages.
.9	Other Public Buildings.		Chalets.
.91	Exhibition Halls.	.8	Country Seats.
.92	Temporary Halls. Tabernacles. Wigwams.	$.81 \\ .82$	Castles. Chateux.
.93	Workingmen's Clubs and Institutes.	.83	Manor Houses.
.94	Town Squares.	.84	Villas
726	ECCLESIASTICAL AND RELIG-	.85	Log Houses.
	IOUS.	.86	Bungalows.
.1 .2	Temples. Mosques.	<b>728.9</b> .91	Out-Buildings. Porters' Lodges.
.3	Synagogues.	.92	Servants' Quarters.
.4	Chapels. Sunday-school Buildings.	.93	Kitchens and Laundries.
.5	Churches.	.94	.1, Stables2, Carriage Houses3, Garages.
.51 $.52$	Frame. Brick or Stone.	.95	Barns, Granaries.
.521	Small Audt., seating less than 600.	.96	Dairies.
.522	Large Audt., seating more than 600.	.97	Ice Houses.
•6	Cathedrals.	.98	Conservatories. Green Houses. Graperies.
.7 .8	Monasteries. Convents. Abbeys. Mortuary. Cemetery Chapels. Re-	.99	Other.
	ceiving Vaults. Tombs. Other. Y. M. C. A., etc.	729	ARCHITECTURAL DESIGN AND
.9			DECORATION.
727	EDUCATIONAL AND SCIENTIFIC. Schools.	. <b>1</b> .11	The Elevation.
.1 .11	Ward and Grammar.	•11	Composition; .12, Distribution; .13, Proportion; .14, Light and Shade;
.12	High Schools.		.15, Perspective effect; .15, .16, .17,
	Study and Recitation Rooms. Not		.18, .19.
.2	including dormitory or boarding.  Academies. Seminaries. Boarding		For projection of shadows and graphics of light and shadow see
	Schools.		515.63 and 515.7.
.3	Colleges. Universities.	.2	The Plan.
.4	Professional and Technical Schools.	.21	Elements required; .22, Distribution;
.5	Law, Theology, etc. Laboratories: Physical, Chemical. See		.23, Proportion; .24, .25, .26, .27, .28, .29.
	542.1, Biological, etc. Zoological and	.3	Elementary Forms. For construction
	Botanic Gardens. See also 590.7 and	0.4	of these forms see 721.
.6	580.7. .1, Museums2, Herbariums. See	.31	Walls. Mouldings. Cornices32, Piers, Columns, Pilasters, Pedestals
.0	580.7.		and the Orders. Colonnades33,
.7	.1, Art Galleries2, Studios.		Arches and Arcades34, Vaults and
.8	Libraries. See 022, Library Build-		Domes35, Roof. Spires. Dormers36, Towers37, Gables and Pedi-
.9	other. Learned Societies, etc.		ments38, Doors and Windows.
728	RESIDENCES.		Bays. Oriels39, Stairs and Balus-
.1	Tenement Houses.		trades. See also 515.83, Stereotomy;
.11	City Homes of Poor.	.4	604.8, Building. Painted Decoration.
.13	Country Homes of Poor. Cités Ouvrieres.	729.5	Decoration in Relief.
.2	Collective Dwellings.	.6	Incrustation and Veneering.
.21	Flats; one family to the floor. Small Flats less than 8 rooms.	. <b>7</b> .71	Mosaic and Marble.
.211	Large Flats, Srooms or more.	1	Mosaic Ceilings; .72, Mosaic Walls; .73, Mosaic Floors; .74, Other Mosaic
.22	Apartment Houses; more than one		designs; .75, .76, .77, .78, .79.
	family to floor.	.8	Stained Glass Design. For technical
.221	Five Suites or Less. Six Suites or More.		processes see 666.1; for history see 748.
.222 .2221	Elevator Service.	.9	Architectural Accessories and Fixed
	No Elevator Service.		Purniture.
.3	City Houses. Mansions. Palaces.	.91	Altars, Pulpits, Tribunes, Dais Thrones (Ecclesiastical).
.31 .32	Between party-walls. Stone. Between party-walls. Brick.	729,92	Seating for Public Buildings.
.33	Between party-walls. Partly wood.	.921	Benches; 2, Settees; 3, Portable
.34	Semi-detached, including end houses	0.9	Chairs and Opera Chairs.
0.5	in city blocks. Stone. Semi-detached, including end houses	.93	Domestic Chairs, Tables, Couches, Stools, Beds, etc.
.35	in city blocks. Brick.	.94	Buffets.
.36	Semi-detached, including end houses	$.95 \\ .96$	Mantels. Overmantels. Andirons. Steel Furniture.
0.7	in city blocks. Partly wood.	.97	Window Shades.
.37 .38	Detached. Stone. Detached. Brick.	.98	.1, Organs2, Pianos.
.39	Detached, Partly wood.	.99	Lighting Fixtures.
.4	Club Houses. Buildings for Secret	730	SCULPTURE.
_ E	Societies. Hotels.	731 732	MATERIALS AND METHODS. ANCIENT.
.5 .51	City Hotels.	732	GREEK AND ROMAN.
.52	Summer Resorts.	734	MEDIEVAL.
.53	Country Inns.	735	MODERN.
.6 .61	Village and Country Homes. Village Dwellings. On small lots.	736	CARVING. SEALS. DIES. GEMS. CAMEOS.
.01		727	
.62	Stone.	737	NUMISMATICS. COINS. MEDALS.
.62 .63	Brick.	738	POTTERY. PORCELAIN.
.62			

## INDEX TO MISCELLANEOUS AND USEFUL INFORMATION.

According to Decimal System with Page Numbers and Relative Index.

American Expression in Architecture. Vol. XII, 263.

Ancient and Primitive Architecture. F. 722.

Apartment Houses. Flats. Family Hotels. F. 728.2. Arch, To Find Radius of. F. 692.1, p. 275, Vol. XII. Arched Construction. F. 721.4. Architecture. F. 720. Architecture, American Expression of, Vol. XIII, 263. Architectural Accessories and Fixed Furni-ture, F. 729.9. Architectural Construction. F. 721. Architectural Construction. F. 121. Architectural Design and Decoration. F. 729. Arithmetical Tables. F. 690.12, p. 279-280.

Barrels and Boxes, Dimensions of, F. p. 280. Base Plates for Columns. F. 690.12, p. 219, Vol. XIII.
Bay Windows. 692.1, p. 287.
Beams, Small T, Functions of, p. 239.
Beams, Wooden—Formula F, 690, p. 269.
Beams, Yellow Pine, Table of, Strength of, p. 270-271. Beams, Yello

Bearing Plates for Columns and Beams. p 219, Vol. XIII. Billiard Rooms, Sizes for. F. 692, p. 285. Board Measure. F. 694.0, p. 293. Boiler Efficiency. p. 298.

Boilers, Steam and Hot Water. F. 697.43, p. 298.

298.

Bonds Used in Brickwork. p. 282.

Bowling Alley. Sizes for. F. 692. p. 285.

Breweries—Data. F. 692. p. 282. Vol. XIII.

Brick Construction. F. 693.2, p. 289.

Brick, Old. Meas. of. F. 693.2, p. 289.

Brick-work, Wt. of. F. 693.2, p. 289.

Building. F. 690.

Burned Clay Tile. F. 693.4. See 691.4.

Carpentry, Joinery, Mill-work, Cabinet-work, Stair-building. F. 694, p. 290. Catalogues, System of Filing. p. 311. Classification for Filing Data, Drawings, Plates, Catalogues, etc. p. 311.

Classification for filing Data, Diawings, Plates, Catalogues, etc. p. 311.
Coal, Space Required in Bins. p. 298.
Code of Professional Ethics. p. 21,
Concrete, Economics of. 213, Vol. XIII.
Conveying Machinery in City Buildings. 247, Vol. XIII.

Conveying Machinery, by S. F. Joor, p. 243. Ceilings. F. 721.7. Cement, Standard Specifications for, p. 235. Cementing Materials. F. 691.5, p. 278, Vol.

Ceramic Products. 691.4.
Ceramic Products. 691.4.
Circle, Mensuration of. F. 692. p. 276.
Cisterns—Canacities. F. 696.413. p. 296.
Clay Products. Burned. F. 691.4.
Columns. Cast Iron—Safe Loads. F. 690.12,
see 694.912, p. 261. Vol. XII.
Composition. F. 695.6.
Concrete in Pounds Per Sa. Inch, Ultimate
and Safe Strength of. 272.
Concrete Work, Bules of Measurement. 183.
Contracts. Agreements. Bids. Advertisements. F. 692.4.
Conveying Machinery in City Buildings. p.
247. Vol. XIII.
Conveying of Materials, Continuous. p. 243, XIII.

Conveying of Materials, Continuous. p. 243, Vol. XIV.

Covering, Overlaying (Roofing), F. 695, Crosses and Symbols, F. 726, p. 299, Vol.

Crushed Stone, Voids in. Vol. XI, p. 259.

Deafening Felts and Quilts. F. 695.7. Doors, Grates, Grilles, Windows. F. 721.8, \_ see 694.63. Drainage. F. 696.1.

Drain Pipes—Canacities, F. see 696.1, p. 297. Drains and Wells, Brickwork in. F. see 696.22, also 696,413, p. 297.

Drawings, General; Helps in Preparing. F. 692.01, p. 280.

Editorial, p. 19.
Electric Equipment for Illumination and Communication. F. 696.9.
Ellipse and Parabola. p. 237, Vol. VI. Engineering. F. 620. Estimate—Data, p. 288. Estimate—Data, p. 288. Estimates on Carpentry. See F. 694, p. 290. Fstimates on Painting. F. 698 p. 300. Estimates, Quantities, Cost. F. 692.5. Excavation, Rules for Measurement of, 185 Exposed Metal-formed Joints and Protections, Finish Hardware. F. 694.24.

Filing Catalogues, and Drawings, and Plates. Finishing, of Wood. p. 255, Vol. XIII. Fire-proofing. F. 693.7. Flooring Material, of Wood. 694.67. Floor Loading. p. 269, Vol. XIII. Floors and Flooring. F. 721.6. Foundations. F. 721.1. Foundations of Buildings. p. 142, Vol. I. Freight Cars, Sizes of. p. 286. Freight Cars, Sizes of. p. 286. Fuel, Space Occupied by. p.

Furnaces. F. 697.3.

Gas Fitting. F. 696.7.
Gauges and Their Equivalents. p. 275.
General Works. F. 600.
Glass. F. 691.6. p. 277. Vol. XIII.
Glass, Light Passing Through. F. 691.6, p. 277. Vol. XIII.
Glass—Surface Heated by Radiation. F. 697, p. 299. Glass and Glazing. p. 257. Glazing. F. 698.5. Grades, Per Mile, Water Mains—Table of.

F. 696.1 and .2, p. 296. Gravel Roofing, Specifications for. p. 295. Gravel, Use in Concrete. 213, Vol. XIII.

Heating and Ventilating. F. 697, p. 205, also Heating and Ventilating. F. 53, p. 299, p. 298.
Heat, Transmission of, F. 697, p. 299.
Hollow Tile and Porous Terra Cotta Construction. F. 693.4.
Hospitals and Asylums. F. 725.5.
Hot Water Heating. F. 697.41, p. 298.
Hints and Formulae, pp. 205 to 219.

Impurities in Water. F. see 696.4, p. 296 Iron and Composite Structures. F. 721.5.

Joinery, General Mill-Work. F. 694.6. Joists—Carrying Capacity. F. 690.12, p. 260. Joists—Ca Vol XII

Joists—Carry....
Vol XII.

Landscape Gardening. F. 710.
Law, Data for Architects. p. 255, Vol. XIV.
Law for the Licensing of Architects. p. F.
692.95, p. 139, Vol. III, p. 145, Vol. V.
Laws Pertaining to Building. F. 692.9.
Lead—Sheet. F. see 691.84, p. 287, Vol. XIII.
Legal Standing of an Architect. p. 213,
Vol. VII,
Lien Law. p. 139, Vol. VI.
Light. Transmission of. 277, Vol. XIII.
Light. Transmission of. 277, Vol. XIII.
F. 799.99.

Light, Transmission of. 277, Lighting for Billiard Pooms, Lighting Fixtures, F. 729.99, Limes—Cements—Plasters, F Vol. XIII. F. 691.5, p. 278, Liquids, Hydrostatics, Hydraulics. F. 532.

Manufactories. F. 725.4. Manufactories. F. 725.4.
Masonry in Pounds Per Sq. Inch, Ultimate and Safe Strength of. 273.
Materials, Building. F. 691, p. 279.
Materials, Strength of. p. 237.
Materials, Wts. of. F. 691, p. 279.
Measures, Tables of. p. 275.

Measurement of Brick. p. 289.
Measurement of Carpentry Work. 290.
Measurement of Concrete. 239.
Measurement of Plainting. 300.
Measurement of Plastering, Bules for. 239.
Mechanical Engineering. F. 621
Mensuration Formulae. p. 276. Smoke Flues and Prevention. F. 697.8, p. 287. Vol. XI. Smoke Inspection, Rules of. Vol. XII, p. 185. Solders. F. 691.8. p. 277, see 695.2. Specifications. F. 692.3. Stables, Dimensions of. F. 728.941, p. 285. Stained Glass Design. F. 729.8. Metal Formed Joints, Concealed Rough Hardware. F. 694.23. Stains, Creosote. F. 698.13, p. 301. Stair Building. F. 694.8. Metal Lath and Furring. F. 693.96. Metals, Except Iron and Steel. F. 691.8, p. 277. Vol. XIII. Stairs. F. 694.8. Stairs. Table for Calculating Treads and Risers. F. 692.1, p. 284.

Stairs, Table Treads and Risers of. 284.

Stairs, Table Treads and Risers of. 284.

Steam Heating. F. 697.42, p. 207.

Hints and Formulae. pp. 205-219.

Contractors for. pp. 204-221.

Steam Mains, Formulae for. 298. Metals—Phys. Properties. F. 669, p. 278. Metallurgy and Assaying. F. 669, p. 278. Mill-work, 694.6. Mosaic and Marble. F. 729.7. Nails for Different Work, F. 694.231, p. 293. Natural Science. F. 500. Nomenclature of Drawings. F. 692.1, p. 280. Steam Mains, Sizes of. F. 697.42, p. 294, also 235, also Vol. XI, 287. Office Hours and Holidays. p. 199, Vol. VII. Orders of Architecture. File 729.3, p. 302. Steel Building Const. p. 165. Vol. VII, p. 163, Vol. V. Organs. Pianos. F. 729.98, p. 285. Steel and Iron, Corrosion of. F. 691.7, p. 276. See Vol. XI. Paint and Painting. F. 698, p. 300. Painted Decoration. F. 729.4. Stone, Artificial. F. 691.3. Stone, Natural. F. 691.2. Painting Time an Important Factor. p. 255. Vol. XII, Stone Voids, Settlement and Weight of, Crushed. p. 193, Vol. XII. Strains Defined. F. 620.1, p. 197, Vol. XIV. Painting Structural Work. p. 259. Vol. XIII. Paints, Table for Mixing. F. 698, p. 300. Paints, Wall, Sanitary, Value of. p. 233. Strains Defined. F. 620.1, p. 121, v...
Strains Defined. F. 694.3.
Strengthened Beams. F. 694.3.
Strength of Concrete, Table of. 273.
Strength of Masonry, Table of. 274.
Strength of Materials. F. 620.1.
Wood, Joist and Timber. p. 272.
Machanics of Materials. p. 197. Vol. XIV. Pianos, Sizes of. F. 692, p. Pianos, Size of. n. 285 Piers, Columns. F. 721.2. Pine Wrought Iron—Dim. 692, p. 285. Mechanics of Materials. p. 197. Cast Iron and Steel Base-Plates. p. 219. F. 696.5, see 697.442, p. 296. Reinforced Concrete Beams and Col-umns. pp. 239-247. See Vol. XI for Plans and Specifications. F. 692. Plastering. F. 693.9. Talbot Formula. Plastering, Rules for Measurement. p. 241. Plumbing. F. 696.3. 100 lbs. Live Floor Load. Stress in Materials, p. 197, Vol. XIV. Prisons and Reformatories. F. 725 6. Structural Materials-Cement and Steel-Protective Coatings for Various Structural Materials. 295. Vol. XIII Structural Materials—tement and Si Specifications, p. 191. Structural Work, Painting, 259, Vol. X Structural Steel for Buildings, Star Specifications for. p. 191, Vol. XIV. Superintendence, F. 692.6, Materials. 295 Vol. XIII Protective. Preservative and Decorative Cov-259, Vol. XIII. Standard ering (Painting, Wall Hanging, Glazing, Floor Covering). F 698, p. 300. Public Buildings. F. 725. Swimming Tanks. F. 692, p. 286. Pulleys, to Calculate Speed of. F. 621.85, p. 296, Vol. XIII. **Tables, Metric.** pp. 276-279. Tables, Misc. Measure of, F. 389, pp. 275-276. Tanks, Swimming. p. 286. Terra Cotta Construction. F. 693.3. Radiation. F. 697.45. Reinforced Concrete. F. 693.6. Reinforced Concrete, Rules of Measurement. Terra Cotta Construction. F. 505... Timber, Contents in. F. 694, p. 293. Tin Roofs—Data. F. 695.0, p. 294. Transmission Machinery. F. 621.8, p. 271. Reinforced, Strongth of p. 272 Vol. XIII. Reinforcement, Tables of, By B. E. Wins-low, F. 690.12, p. 272, Vol. XIII Reservoirs for Storage and Service, F. also 249, Vol. XI. Transportation and Storage. F. 725. 3. Treads and Risers. F. 692.1, p. 284. Trigonometry. F. 514. 696,413, Residences. F. 728. Roofing and Roofing Material. Vol. XII, F. 695. p. 215. 281. Useful Arts. F. 600. Roofing Composition, Specifications for. p. Varnish. p. 253. 295 Vault Covers and Sidewalks. Vol. XII., p. Roofs. F. 721.5. Roots, Square, p. 277. Vehicles, Sizes of. F. 728.942, p. 285. Voids in Crushed Stone. Vol. XI, p. 259. Safe Strength of Wood, Table cf. 275. Sanitary Equipment, Illumination. F. 696. Walls. F. 721.2. Sanitary or Plumbing Ordinances. p. 174. Vol. IX. Water—Expansion—Wts, and Tests. p. 277. Water, Overhead System. 298. Water Pressure at Different Elevations. p. Scagliola. F. 693.94. Schedule of Professional Charges. p. 27. Sewerage. F. 696.2. Water, Pure Tests for. p. 297. Weights and Measures. p. 264, Vol. XII. Weights of Building Materials. F. 691, p. Sewer Grades, F. 696.2, p. 297. Sewers. Design and Construction. F. 696.2. pp. 296-297. 279.249.
Windows, Bays, Angles of, F. 692.1, p. 287.
Wind, Velocity of, F. 389, p. 264, Vol. XII.
Wiring Specifications, Suggestion on, p. 254.
Wood, Finishing of, p. 255, Vol. XIII.
Wood in Pounds Per Sq. Inch, Ultimate and
Safe Strength of, 274. pp. 236-237.
Sewer Pipes, Discharge of. F. 696.2, p. 297.
Sheet Metal. F. 695.2, p. 290.
Shingle Stains—Data. F. 698.13, p. 300.
Shingles, Wood. F. 695.1, Vol. XI.
Slate. F. 695.25, p. 294.
Tile. F. 695.26.
Sidewalks and Vault Covering. Vol. XII, p. 189

Slating-Memoranda. F. 695.25, p. 294.

Wood in Pounds Per Sq. Inch, Ultimate and Safe Strength of. 274. Wood Shingles. F. 695.1. Wooden Bulldings, Preservation of Exterior of. p. 223, Vol. XIV. Woods, Weight of. F. 691.1, p. 279.

## INDEX TO BUILDING ORDINANCE.

(See Pages 65 to 155.)

	Section	Section
A	No.	No. Area—Floor maximum (Class VII). 481-482
Access to rooms, otherwise than through		Of floor for each standpipe 269
bed rooms (Class 6)		Of habitable room
Air volume per person (Class II, b). See also Ventilation (Class 6)		Of lot occupied by residence 271
Aisles—Grandstands and bleachers,		Of stage vent (Class IV. b)320a
quirements		Of stage vent (Class IV. c)347a
Cross (Class IV. c)	336	Of window 274
Assembly halls, recitation and stu		Floor—in tenements: Restrictions as to alterations, etc., for living pur-
rooms (schools), requirements	501	poses
Least width—"main" aisles—obstrutions (Class VII.)	487	Vent shafts 443
Passageways and hallways; requirements (Class IV. a, b and c)294	re-	Tenement house, percentage of lot al-
		lowed to be covered
Class V		Assembly Hall—(Class IV. b)240j & 300
Required each side of seats		In schools, requirements496 and 501
Steps in (Class IV. c)		Asylum Buildings240f, 254c, 263
Alcoves-Must comply with Section 4		Athletic Amphitheatre
(Class 3)	275	Parks—Included under (Class IV. d) 356
And alcove rooms (Class 3 & 6. Ter		Attic—(Class 6). Living purposes—restrictions as to alterations for 476
ment house, definition and constrution		Auditorium—Floor height (Class IV.
Alteration of buildings-General requir		c)331a
ments512		Frontage (Class IV. a) 288
In tenement house—permit for		Frontage (Class IV. c)
Alter any theatre unlawful		Automatic Sprinklers: Class V
Unlawful (Class IV. d)		Tanks
Amusement Parks—Flevator Inspect in charge examine and appro	01'	Tanks (Class V.)
plans, etc	220c	(See fire apparatus.)
Included under (Class IV. d)		Auxiliary Buildings—As part or whole of Class IV. b; construction require-
Provisions governing	362-368	ments 302
Amusement—places of: Annual inspetion	ec- 237	Axes, Standpipes, Pumps, etc.—See Fire
Certificate required prior to issue	of	Apparatus.
ncense	721	В.
Diagram of seats on programs		BakeriesVentilation, location256d Balcony-Construction to be either steel
Doors or gates not to be locked when	725	or wrought iron
Frontage consents-when necessary		
Lighting requirements722-7		Balconies and Galleries—What constitute, etc., in Class IV. b309-310
Apartment house	240n	Class IV. c, requirements 335
Definition	432b	Class V., requirements383, 408
Boiler chimneys	576	In hospitals         268           Balcony—Over street         230e
Divided by masonry (Class 6) Apparatus for fighting fire	455	Banquet Hall
Appeal from Decision		Included under Class IV. b280, 300
Approval of Plans		On any floor in fireproof buildings;
	in	limit 900 persons 306
questions of damage to or securi	tv	Barns—See Stables and Barns 616
of buildings		Under 500 square feet
Archies in fireproof construction Architect must	638	Base Ball Bleachers—(Class IV. d) 356 Baseball Park:
Certify as to floor loads	251	Included under Class IV. d 356
Certify as to compliance with law.2		Seats240-1
Seal and sign plans		Basement—(Class VI.) in re wall con- struction
Draw plans to scale	231	struction
Not alter stamped plans  Not allow departure from stamp		when allowed506b
plans	239	Tenement houses (when raised); requirements

Section No.	$\begin{array}{c} \mathbf{Section} \\ \mathbf{No.} \end{array}$
Basement and Cellar—Definition432-599	Contractors not to commence work without permit239d
Sub-basement and cellar; construc- struction requirements—pipes and	Construction or alteration of existing
openings, dumb-waiter, cable, etc., passing through, enclosure re-	—provisions governing513-14 Damage by fire (Class 6)472½
quired	Damage or question of security; pro-
Bath Room—(Class II.) building256c	visions governing arbitration in re206-7-8
Bath Rooms—In dwellings276 & 274  Bath Rooms, etc.—(Class III.) require-	Department established: appointment of Commissioner; bond required; his
ments 276	duties and authority as to assist-
Bay Windows—Light Courts—Shafts: Construction	ants
Eay Windows and Light Shafts—(Class III.), when allowed 277	and doors302, 303
Beams—See Fireproof Construction, Re- inforced Concrete, Timber and Gir-	Existing, used as Class V. built in conjunction with other classes; requirements as to doors 376
ders548, 632	Fire Department tear down or remove at direction of Commissioner 204
Billboards, Sign-boards, Signs and Fences—Everything pertaining to	Buildings, Frame—Basement or story
695-710	placed beneath; floor level—walls— height limit
when necessary 712	Changing into flat buildings—separating wall requirement 655
Block (City Block)—See Frontage Consents	Chimney requirements—metal smoke pipes or flues through floors and
Board of Education—Fire escapes on	partitions
schools: President of Board report as to, three times yearly 509	Erection within fire limits prohibited —exception; erection outside limits
Boarding, Sales or Livery Stables— Forbidden on residence streets 616	—requirements
Boilers, Inspector of—Plans of buildings—duty to inspect, when 230	Lot line requirements 660
Boilers (Steam)—Ceiling, protection of	Moving picture shows not allowed in after June (July) 1st285, 332, 400
—asbestos, cements, etc., covering, 588 Floor protection around 587	(Sec. 400 only, amended June 26, 1911.)
Location—permit 589	Raising requirements; changing gable
Bond of Brick Work	or hip roofs to flat roofs—two-story and attic, prohibited conversion to
Bonds—Billboard and signboard erection	three-story
Commissioner of Buildings and su-	vision—masonry wall requirement 653 Sheds—open shelter, etc661-662
bordinates200, 226  Illuminated roof signs—to be executed	Uniform height, when carried to—requirement as to habitable rooms 657
prior to erection of710d	Tenements—requirements 451
Street obstructions	Tenements, additions to within fire limits prohibited
Wreckers of buildings235b  Box Office—Communication with	Width on lots—fire walls required when—where more than one on a lot, distance between 660
Box Office—Communication with (Class 5.)	
Brick:  Brickwork—bond of—pressed brick	Height and construction when used wholly or in part for Class IV purposes
facing	Also see Height.
Soft—where permitted 536	Inspection of all in general use required, and power of Commissioner
Wall (brick) not required in Class I 245 <b>Building Department</b> —Officers of, designat-	as to safety precautions and repair. 201 Permits—relating to
ing	229-230-234, 235, 236, 360, 434 (See also Permits and Fees for
Buildings—Amusement parks; concerning erection in	Permits.)
Annual inspection 237	Police to assist Commissioner in enforcement of law pertaining to 209
Architect's certificate as to compliance with plans	Unsafe; refusal of owner to comply with notice to repair; consequences202e
Construction contrary to plans pro- hibited	quences
Brick, stone or concrete (existing); removal unlawful unless, etc 515	dealing with202-205, 208 Water used, in construction; regula-
Built in conjunction with (Class V.).	tions and fees
to be fireproof	Wrecking, permits, etc
50 feet in height, must be of slow- burning, mill or fireproof construc-	Roof constructions as to bearing
tion244b	loads
(Class I.) of ordinary construction limited to four stories244c	term and provisions governing 569 Structural detail; tests, how made 517
Constructed in violation of law; authority to tear down or stop203, 205	Bunting—Exhibition and exposition halls; when allowed

C. Saction	Section
Section No.	Right of entry (Class V.)
Capacity of Rooms-Flaces of amuse-	Roof signs-illuminated; and other
ment and theatres—certification for license322-349-399-423	duties in relation to710be
Capacity—Seating, how computed (Class	Theatres, halls, etc., duties relative
IV.) 298	to and in connection with
Camp-stools, Sofas, etc.—Not allowed in aisles, etc., of theatres 311	City Officers—Power of entry228-283-370
Canopy—Construction requirements and	Power to close284-371-511
permit	Class-Where buildings are used for
Over street230e	more than one—requirements per- taining thereto
Ceiling-Protection frem boilers, etc 588	Classes—Definitions of—(Class I.) 243
Structures over (Class IV. b) 318	Class II. (and its subdivisions) 254
Structures over (Class IV. c) 344	Class III 270
Structures over (Class V.)	Class IV. (and its subdivisions) 280
Tenement houses where stores occupy first story:	Class V
(See Tenement House.)	Class VI
Ceiling and Roof-Space between (Class	Class VII. 478 Class VIII. 492
I.), concerning	Classification of Buildings—From I. to
Cellars and Basements—Definition 599 (See also Basement.)	VIII 240
Cellars in Dwellings	Closing Buildings for Cause—(Class
Cement-Plaster covers, skeleton steel	IV.)
walls requirements in 245	Schools
Tests, requirements 556	Clubhouse—(With sleeping accommoda-
Certificate—Architect—as to floor load. 251 As to plans complying with law., 238, 618	tions for less than 20 persons) in-
Elevator (lift) inspection—to be	cluded in Class II. a; more than 20, Class II. b
posted 689	General classification
Of capacity of rooms in Class IV. b, e	Coaster Devices—Roller 362
and V., prerequisite to issuance of license322, 349, 399, 423	Coffee Roasters-Floor protection 587
Signature of Commissioner necessary;	Cold Storage Houses-Fire precau-
record to be kept of department 210	tions
Chimney—Concrete (reinforced)—air	Collective Dwelling
Chimney—Concrete (reinforced)—air space 574	Formulae for metal541b
External; not to encroach on street	Formulae for metal and concrete541d
or alley—location—anchoringiron base	Formulae for reinforced concrete 552
Flue-lining requirements	In fireproof construction; requirements624-5-6
	Theatre walls—alterations 375
Frame building—construction requirements	Thickness, construction and height 519
Height above roof (dwellings) 577	Commissioner of Buildings and Subor-
Insulating lining 575	dinates—Appointment, bonds, etc 199-200-200½ and 213 to 226
Insulating cavities—where required., 578	Commissioner of Buildings—Power to
Insulating material 580	pass on all provisions of building
Interior—framing around—joists and girders not to rest on 581	ordinance
Isolated—design and construction 583	tion—duty in re frontage consents, 265
Isolated—permit for—fee234e	(See also note end of ordinance page 153.)
Metal, and metal stacks; insulating material 580	Power to close buildings of Class V., 371
Metal or reinforced concrete in fire-	Right of entry (Class IV.) 284
proof buildings—air space; construc-	Right of entry (Class V.) 370
tion, etc574-575  Metal. in ordinary, slow-burning or	Tenement house (new)—eertificate
mill construction 579	from—necessary before occupation 435 Commissioner Public Works—
Tenement and apartment house boiler. 576	Must pass on permits, when230c
Walls forming smoke flues—material. 584	Storage space in street or alley—may
Chimneys and Flues—Tenement house requirements	limit or restrict
Church Building or Place of Worship-	from, necessary, etc
(Class IV. a)280, 287b	Complaint—
Classification	Investigation 212
General requirements	Of citizens, action on201b
Cinder Concrete—Provisions governing	Record of
use 568	Concrete—Cement tests
(See also Concrete and Reinforced Concrete.)	Cinder concrete, provisions governing
City Electrician—Power to close build-	use 568
ing of Class IV. for violations 284	Foundation piles; tests, how made 531
Same as to Class V	Framework requirements in Class I 245
Right of entry (Class IV.) 284	Sand, stone and mixing557, 558, 559

Section	Section
No. See also Reinforced Concrete545 to 566	No. Construction—when may be slow-burn-
Conflict—Between general and special	ing, mill or fireproof 479
provisions—special to govern 242	Court requirements; windows, doors,
(See also Sec. 433, as to question of conflict.)	etc., to have metal frames 484
Construction—Buildings used for more	Doors: Dividing walls—how built 490
than one class—provisions govern-	Exit—percentum of width 486
ing 241	Street level—revolving doors 489
Capacity to determine (Classes IV. a.	Exit signs and lights486, 488
IV. b and IV. c)290-304-332	Fire drill
Fireproof defined	(See ordinance passed July 18,
Ordinary defined	1910.)
Slow burning defined 646	Floor areas—maximum
Construction or Alteration—General pro-	Floor areas exceeding maximum 482 Galleries, mezzanine or intermediate
visions	floors; area, height, stairways and
Control of Lighting—(Class IV. a) 299	general construction 483
Corner Lot Defined 437	Halls, stairs, passageways, aisles,
Cornices, Eaves, Gutters, Fipes from Roofs—Metal required except, etc.;	signs and lights
bracket requirements 591	pendent lights—red lights 486
Corridors, Passageways, etc., and	Loads—allowance for live 491
Doors-Width-computation (Class	(See also 516.)
IV.)	Locker provisions 480
Same as to Class IV. b 312	Passageways, stairs, halls, aisles,
Same as to Class IV. c	signs and lights         486           Signs (exit) and lights         486, 488
Same as to Class V	Stairs, halls, passageways, aisles,
Same as to Class Schools	signs and lights 486
Courts:	Stories-what constitute, and how
(Class II.); requirements256ae	numbered
Definition of 432	grade) may be used for sale of
Department stores; requirements 484	goods or manufacturing 480
Inner and outer required for tene- ment house (as defined in 432); mini-	Derricks-Use and limitations 612
ment house (as defined in 432), mini- mum widths and areas	Detention Houses240f, 254c and 263
Light courts—construction 603	Domes—(See Towers, Domes and Spires.)
Tenement houses; requirements as	Doors—Amusement places of—not to be locked, when
to	Between Class V. buildings and build-
(See also Shafts and Vent shafts.)	ings of other classes; restrictions as to
Court Walls-Window and door require-	Connecting (Class V.)
ments	(Class IV. a), requirements295, 297
Coves—Hospital requirements 266 Cross-Aisles—(Class IV. c) 336	Dividing walls—openings prescribed, 490
Cubic Contents Habitable Room—(Class	Dividing walls—iron door require-
III. & VI.)	ments
Cubic Feet of Air per Person—(Class	Emergency exits to open outward 297 General provisions as to572-573
II. b)	In fireproof construction—require-
roof 590	ments 630
Curtains—School assembly halls; restric-	Lifts (elevators), requirements685-686
tions 505	Locked or fastened (Class IV. b)315b
Theatres to have incombustible; other requirements; inspection and fee.	Not locked or fastened (Class IV. c), 340
317, 342, 389, 412	Openings in Class I
	and VIII.), nature of protection;
D.	iron; wired glass in metal frames 572
Damage to Building or Question of Se-	Outward opening provision, and draping prohibited315, 340, 385, 386
curity—Arbitration, relating to206 to 208	Revolving, in Class I
Damp Proofing—Tenement house (new)	Revolving, department stores 489
- basement requirements 457	Rolling, sliding and swinging iron,
<b>Dance Hall</b>	steel or tin-clad; requirements 573d, e, h, i, k
Dance Hali 300	Schools—to open outward 500
Dance Hall—Included under Class IV b240, 280	Space in front of (Class V.) 380
Department of Buildings Established—	Swinging iron and tin-clad; require-
Commissioner, his appointment, bond,	ments
duties and appointment of subordin- ates199-200-2001/2	Swing doors—when required 572
Department Stores—Classification240 b & o	Theatres (Class V.): Entrance—basis for computation of widths 386
Aisles: Stair aisles 486	Theatres (Class V.): vestibule for
Aisles: General provisions 487	stage doors to prevent draughts 391
Basements—sale of goods in; limita- tion as to sub-basements 480	Theatre procenium openings (other than curtain); requirements317, 343
tion as to suppasements 100	,, requirements

Section	Section
No. Theatre entrance, width prescribed. 386	Existing Theatres
Width—computation (Class IV. b) 312	Existing theatres may not increase seat-
Down spouts—requirements 591	ing capacity—(Class IV.)
Width of (Class IV. c) 340	Exits—Provisions governing:
Draperies and Bunting—Exhibition and exposition halls; when allowed, etc 304	Amusement, places of 722, 723, 725, 726
(Class IV. b) restrictions 315	(Class IV.)
(Class IV. c), restrictions         340           Fireproofing (schools)         505	(Class V.)
Dressing Rooms in Theatres—(See	379, 381, 388, 395, 405, 406, 409, 411
Theatres.)	Schools502, 503 (See also Emergency Exits.)
Dwellings—Definition and general requirements	Exit Signs—Places of amusement, halls
Dwelling	and churches; requirements covering day and night299, 323, 395, 420
	Exposition and Exhibition Halls—(Assembly halls.) (Class IV. b)
<b>E.</b>	240, 284, 300
Eaves, Cornices, Gutters and Pipes 591	Exposition Hall287e
Electrical Conduits—(See Gas Pipes.) Electrical Requirements:	Exits Locking or Fastening of—pro- hibited297b
(Class IV. b.)	Exposure—Street or alley (Classes IV. a, b, c and V.).228, 289, 301, 331, 402
Fuse box covering 321	
Light requirements 323, 324	Extensions of Existing Buildings 247
(Class IV. c.)	F.
Fuse box covering	
(Class V.)	Family Residences and Garages and Stables—(Less than 500 square feet
Fuse box covering392d	area) included in Class III 270
Light requirements395, 396, 424, 425	Fastening Exits Prohibited—(Class IV.
(See also Lights.) Cut-out boxes, chases, etc., in fire-	a)
proof buildings requirements 637	c) 340
Electrical Equipment Maintained—(Class IV. b)	Fees for Permits and Inspection—Ac-
Electrical Equipment Maintained—(Class	counts of to be kept; report to council of receipts
117 0) 348	Alterations and repair of buildings234b
Elevation of Main Floor—(Class IV.	Billboard or signboard—erection and inspection234c, 706a
Elevators (Grain)—Bulk grain, hreproof	Buildings other than sheds, erection
structures required (Class I.) 253	of
(See Class I., for classification.)  Fire apparatus and watch service	Repair or alteration
Fire apparatus and water 5675, 676, 677	Buildings (under requirements of
Elevators (Lifts):	Sec. 237)234c Curtains in theatres—iron, steel or as-
Enclosures (Class II. b)	bestos, inspection of234c, 317, 342, 389
Hospitals—provisions governing 267 Inspection of	Elevator (lift), installation or alteration234c
Permit and fee therefor—general re-	Iron door or wire work, enclosures
quirements	around681c
Emergency Exits—Provisions governing.	
	Elevator (lift), inspection (semi-an- nual)234c
(Class IV. a) 297	nual)
(Class IV. b)311, 314, 323	nual)
(Class IV. b)	nual)
(Class IV. b)	nual)
(Class IV. b)     311, 314, 323       (Class IV. c)     339, 350       (Class V.)     388, 395, 411       Places of amusement     722       Schools     502	nual)         .234c           Fire escape crection         .234c, 670b           Fire escape inspection         .670b           Illuminated roof sign, inspection and approval         .234c, 710c           Fees Method of Estimating         .234           Oil tank construction, etc.         .693a
(Class IV. b)       311, 314, 323         (Class IV. c)       339, 350         (Class V.)       388, 395, 411         Places of amusement       722         Schools       502         (See also Exits.)	nual)
(Class IV. b)	nual)
(Class IV. b)       311, 314, 323         (Class IV. c)       339, 350         (Class V.)       388, 395, 411         Places of amusement       722         Schools       502         (See also Exits.)       Employes—Not to engage in other business         ness       227         Enclosures on Roofs—Requirements       594	nual)
(Class IV. b)       311, 314, 323         (Class IV. c)       339, 350         (Class V.)       388, 395, 411         Places of amusement       722         Schools       502         (See also Exits.)       502         Employes—Not to engage in other business       227         Enclosures on Roofs—Requirements       594         Engineering Staff—Duties       214, 215, 216	nual)
(Class IV. b)	nual)
(Class IV. b)       311, 314, 323         (Class IV. c)       339, 350         (Class V.)       388, 395, 411         Places of amusement       722         Schools       502         (See also Exits.)       Employes—Not to engage in other busines         Personant Company       227         Enclosures on Roofs—Requirements       594         Engineering Staff—Duties       214, 215, 216         Entry—Power of       228, 283, 370         Entrances Separate from Exits—(Class IV. b)       310	nual)
(Class IV. b)	nual)

Section	Section
Fire Apparatus—Fire Marshal to con-	Grandstands and bleachers to be
trol 397-8, 417, 418, 421, 426, 674-729-734-735	treated with 358
(See also Grain Elevators and	Scenery to be treated326-7, 353, 390, 413 Schools, curtains, etc
Theatres.) Fire Doors—Auxiliary buildings to thea-	Fire Walls—(Class I.) in re 249
tres and halls; requirements (Class IV. b) (** b and c)302, 303	Frame buildings—when required 660 (See also Walls.)
(See also Sees. 519 and 573.)	"Five-cent" Theatres—(See Moving Pie-
Fire Drills: Department stores.	ture shows.)  Floors—At exits, to be level, etc380, 406
(See Ordinance of July 18, 1910.)	Floor Area of Habitable Room 274
Schools, how maintained, etc 510  Fire Escapes—Changes in position or	(Class 1.), strength, and display of placards
construction prohibited unless, etc., 679	Department stores, maximum:
(Class II. c) must be equipped with. 268 (IV. b) stairway fire escapes 314	Areas, not to exceed, etc 481
(See also Secs. 669-70 and 673.) Inspection of	Areas, exceeding maximum 482 Fireproof construction
Ladder type-when permitted 671	Fireproof construction, use of wood
Specifications	and nailing strips
Obstructions to prohibited 679	Limitations in Class IV. b 306
Oiling or greasing cables	Limitations in Class IV. e
Pulleys, etc.—ice and snow protection670j Regulations as to construction, num-	Loads permitted.
her and location, in general, 669, 670, 671	(See Loads.) Main, designation in Class V383, 408
Requirements as to buildings of—or- dinary construction	Protection of, in connection with steam boilers, furnaces, ovens and
Mill or slow-burning construction.669e Fireproof construction669f	confee-roasters
Fire Escape Stairway Location—(Class	Temporary, during building construction
IV. b)	Flues—Class IV. a. material composing. 299
Signs indicating location 678 Stairway escapes: Permit fee—loca-	Class IV. b
tion—erection—specifications 670	Class V
Tenement houses         466           Fire Limits—Defined         718	Class VI
Fire Marshal—Amusement parks: Fire	Foundations:
apparatus under supervision of 366 Amusement—places of duty in re	Allowable stresses and special requirements
Elevator hatch doors (lifts): exam-	Buildings 40 or more feet high-re-
ination, etc 686 Grain elevators—jurisdiction as to fire	Quirements
apparatus and precautions675-676 Hospitals, homes for aged, jails, asy-	not rest upon, when, etc
lums, houses of detention, duties in	Depth below surface—must rest on hard soil
relation to	In wet soil—trench requirements 526
Power to close (Class II ) 284	New and old walls—construction—load limit—protection from frost 529
Power to close (Class V.)	Pile borings requirements
Right of entry (Class V.)	Piling: protection against splitting-
	grillage—size of piles—loads (for-mula)530
Standpipes and fire-fighting apparatus —approval of plans230b, 674	Steel rails or beams in concrete—imbedment
Temporary seating structures, to tear down or remove, when 360	Where not permitted 527
Theatres—duties in relation to320,	Foundry: Cupolas—height required
322, 326, 327, 329, 346, 347b, 352, 353a, 358, 390a, c. 392c, 393, 394c, 396, 397, 398, 413a, c, 416c, 417b-	Frontage consents—where necessary 712
418-421-425-426	Foyer not Open to Auditorium V382b Frame Buildings—See Buildings.
Fire Precautions—Steamer Stamese con- nections—regulations and require-	Frontage Consents:
ments 677	Amusement parks
Fire Stop Between Joists—(Class II.	siry. (See also Sec. 117.) 715
Timespeed Construction (Class IV a)	Billboards and signboards
Pireproof Construction—(Class IV. b)	Building operations adjacent to property being built upon
304	Fire limits—provisional, consents for
Definition and general regulations, materials, etc	erection of buildings
Reinforced concrete requirements 564	Gas reservoir, packing house, rendering plant, soap factory, tannery, black-
Fireproof Material—Definition	plant, soap factory, tannery, black- smith shop, foundry, machine shop or factory combined with a foundry
Fire Retarding Sclution—Draperles. bunting, etc. to be treated (Class	or factory combined with a foundry, laundry run by machinery, or livery
IV. b) 304	stable; when necessary

Section	Section
No.	No.
Grandstands and bleachers	Grandstands—Class IV c
(See also note end of ordinance page 153.	Roof 591
Lumber yards, when required 664 Moving frame buildings 714	н.
Open shelter — under what circum-	Habitable Rooms: Class III., what constitutes 274
stances required 662	Frame buildings, changing from one to
Reformatories and like institutions—	two story—requirements 657
when necessary	Habitable Rooms—all classes 274
Sheds—open shelter, when required 662	Halls: Assembly, exposition, exhibition, ban-
Stores—retail—when necessary712a Temporary seating structures (outdoor	quet, dance, lodge and parish, and
exhibitions, holiday and special oc-	those for instruction (other than schools) included under Class IV. b.
casions): requirements	
Frontage Requirements-Class IV. b.	Public or club, used occasionally for
Sec 301	theatrical purposes, not classed as public theaters
Frontages on Street or Alley Required	Halls (passageways):
for Auditoriums: Class IV. a288, 289	Class IV. a requirements
Class IV. b 301	Class IV. b requirements
Class IV. c 331	Class V. requirements
Class V	Class VI. requirements453, 454, 474
Furnaces—Floor protection around 587 Furnace (hot air):	Class VII. requirements 486
Theaters, Class V., prohibited in 419	Class VIII. requirements
Fuse boxes—See Electrical requirements.	Handrails on stairs
	Stairways, when required on379, 405
G.	For wide stairs, Class IV. b 308
Galleries— Class IV. a (exit and entrance) 293	On each side stairs, Class IV. b 308
Class V., designations383, 408	Height:
Rise limitation V382a	Billboards and signboards — height above ground or grade of street 697
Garage—Frontage consents—when neces-	Buildings, Class II. b598, 260
sary	Chimneys above roof
1911.)	Cupola of Foundry         590           Fence         709
Included in Class III. (where less than 500 sq. ft. area)240, 270	Illuminated signs on buildings—pro-
Gas Pipes and Electrical Conduits:	visions governing710ab
Restrictions as to enclosing, in col-	Height of Buildings (ordinance concerning 260 foot limit)—
umns or fireproofing; also the rest- ing of on beams or girders 629	Class I 244
Gas Reservoir:	Class II. a
Five hundred foot limit from public school	Class II. b
Frontage censents—when necessary 712	Class III
General Merchandise Store. Sec2400	Class 1V
General Provisions Governing Building Operations512 to 544	Class IV. b
General and Special Provisions-conflict	Class IV. c
—special to govern 242	Existing buildings, requirements in re
(See also Section 433.) Girders:	increase
Fireproof construction, covering631, 632	Fireproof and non-fireproof (general provisions) 598
Slow burning construction 647	Roof-rise above limit 644
Not to rest on enclosed chimneys 581 Plate; flanges and compression (for-	Frame, changed from one to two story
mula) 544	Height Limit Ordinary Constructed Hos-
Girder Protection Over Ceiling:	pitals 264
Class IV. b	Height Limit, Class IV
Glass Area Requirements—Class III. and	dences
VI 214	Height of Wood Sills Supporting Brick. 277
Grain Elevators: Fire precautions	Homes for Aged and Infirm, or Children, included in Class II. c
Fireproof construction, when 253	Hospital:
	Buildings240f. 254c, 263
Granh in bulk, heepfool structure 253 quired	Coves in rooms or corridors: requirements 266
Grandstands, included under Class IV.	Elevators in, when required 266
d240 I, 356	Frontage consents necessary 265
Grandstands and Bleachers: Construction requirements358, 359	(See also note end of ordinance page 153.)
Loads, allowance for live 357	Included in Class II. c

Section	Section
No. Brick, allowable compression533b	No. Class III., requirements
Definitions 534	Farish Hall—Included in Class IV. b
Foundations of to be laid in cement mortar	Pantries in Dwellings
Piers (isolated) of concrete, brick or masonry—height (formula)533fg	Parish Hall 300
Stresses allowable and special require-	Farish Hall287c
ments (table), (rubble, granite, sandstone, concrete and brick) 533	Fartition: In fireproof buildings641, 642
Mechanical Ventilation—requirements 256	In mill construction building 650
(See also Secs. 432 and 442.)  Merchandise Buildings (sale, storage or	In slow-burning buildings. 647 Material, Class 11, b. 262
manufacturing), included in Class 1240b, 243	Smoke-pipes passing through; require-
Metals:	ments
Allowable stresses (maximum) and special requirements	328, 354, 387, 422
Plate girders, flanges, compression (formula)	Partitioning of Rooms Prohibited Without Permit 274
Loads—live and dead—stresses541, 542	Farty Wall:
Riveting, concerning 543	Provisions governing
Mill Construction:  Definition, materials, etc649, 650, 651	Passageway Location and Direction of in
Moving:	Class II. b
Brick, stone or concrete—requirements as to construction at old and new lo-	See also Halls: passageways.
eation 515	Penalty: Billboard or signboard erection, failure
Frame buildings—permit for—consents —affidavits—space occupied (gov-	to comply, etc 708
erned by Sec. 440)	Illuminated signs, erected without authority
Moving Show280d	Violations of building law 720
Moving Ficture Shows:  Amusement parks; when located in,	Permit: Billboard and signboard
must comply with IV. c364c	Buildings—erection, enlargement, al- teration, repair or renewal, necessity
Frame buildings—not allowed in after June 1 (July), 1911285, 332, 400	of obtaining229, 230
(Sec. 400 only, amended June 26, 1911.) Compliance with provisions of Class	Elevator (lift) (passenger and freight) construction
IV. c)364e	Fees for—(See Fees for Permits, etc.) Encroachments—does not authorize230c
Moving Picture and Vaudeville Theaters:  Definitions and requirements. Class	Illuminated roof signs (by inference).710c
IV. c	Moving frame building
Theatres above first floor declared a	Street obstruction (also bond condi-
nuisance. See ordinances following building ordinances.	- tions)
Mullions: Fireproofed, when	Tenement, for change or alteration 434
N.	Voiding of
Notices by the Commissioner of Unsafe Buildings202b	and revocation in certain cases235, 236
Notice to Commissioner of Health Re-	Picture Machine Booth:  See Moving Picture and Vaudeville.
quired	Picture Shows, Moving240k Piers:
Buildings constructed in violation of this chapter or unsanitary to consti-	Concrete, brick or masonry (isolated),
tute a 719	height, etc. (formula)533fg  Piers (General provisions):
See also 477½.	Loads on, live and dead with tables 518
Obstructions in Aisles, Passageways, etc311, 336, 384, 411g	Pipes: Gas or electric pipes or conduits, re-
Office Buildings—included in Class II. a	strictions as to enclosing in columns or fireproofing; also as to resting on
<b>Oils</b> —storage of	beams or girders
Old People's Homes240f, 263 to 265 Operation of Ventilating System Re-	ments
quired256f	Examination and approval; record of inspections and complaints 212
Ordinary Construction: Definition	Stamping of plans
Class IV. a290, 299a Ovens:	Essentials of
Floor protection around 587	Alterations—concerning
Packing House	Construction contrary to plans unlaw-
Frontage consents—when necessary 712  Pantry—	ful
Class II. building256(c)	ments (originally numbered 722) 605

Section	Section
No.  Plat of Lot—To furnish department	Slabs, beams and girders—designs
buildings with prior to building operations (tenements) 436	for
Plate Girders:	of
See Girders. Plumbing:	crete 547
Requirements in certain cases470, 471, 472	Terra-cotta hollow tile—term defined— stresses not to be exceeded—spe-
Police:	cial provisions in connection with using—columns—walls 567
Assistance to be given commissioner, when, etc	Tests; how conducted 566
Stations, classification240, 254, 263	Walls (curtain) in skeleton construction—requirements 554
Superintendent of, power given to close school buildings, when, etc 511	Reinforced Concrete:
Police Stations, included in Class II. c 254	See also Concrete.  Rendering Plant:
Porches: Parapet walls on—requirements 524	Frontage consents—when necessary 712
Tenement house requirements 459	Repairs or Alterations—powers of the commissioner to require201 b and c
Porches, Verandas and Porticos: Construction inside fire limits 570	Residences, Family—included in Class III
Portable Frame Buildings (Schools) 495	Riveting:
Post Foundations	Holes, diameter, etc
Class IV. buildings 283	Amusement parks, what permitted,
Class V. buildings         370           In general         228	plans, fee, etc
Frojecting Masonry Between Joists:	Roofs:
Class II. b	Construction and pitch 595 Enclosures upon; construction require-
Class III	ments
Public Highway:  No permit for its use until, etc230c	buildings) 656
Pumps:	Rise above limit of height in fireproof
See Fire Apparatus.	construction
R.	Sidewalk-roof over during building
Record of Complaints 212	operations
Record: Of inspections	ited
Of location and character of buildings. 212	Room—cubic contents of
Of notices	Usable Area
Reformatories and Like Institutions:	c240e, 254b
Frontage consents—when necessary 713  Removal (moving) Buildings.	Rooms: Assembly halls in schools—require-
See Moving.	ments 496
Reinforced Concrete:  Beams (I beams); limiting width of	Basement class-rooms 506 Bath, pantry, water-closet and urinal
flange	—requirements
crete 532	tutes 274
Definition of term	Hospitals—tangent coves in
Cement tests—how conducted 556	Tenements—requirements
Cinder concrete construction 568 Columns—limit of length—reinforce-	445, 446, 448, 449, 469, 470, 474, 475 <b>Rubble Stone</b> —Ordinary definition 534
ment—bending moment—tying ver- tical rods	s.
Columns — structural steel — require-	Safety: Power of Commissioner as to precau-
ments	tions 201
External forces—moments of (with formulas)	Safety Devices: Scaffolding and temporary floors 604
Fireproof construction 564	Window cleaning 604
Flanges in beams—width limit	Sanitariums: Frontage consents necessary 265
Freezing and warm weather—placing.	(See also note end of ordinance page
Ratio of moduli of elasticity-adhe-	Included in Class II. c 254
sion—bond (with table) 546 Sand-stone—mixing—placing concrete.	Sawdust: See Inflammable Material.
	Scaffolds and temporary floors during
ommmage and thermal stresses 551	building operations 605

Sect		Section
Scenery:	Э.	Sidewalk or Street Occupation During
Class IV. b, definition and requirements	327	Building Operations:  Provisions governing607 to 615
Class IV. c, requirements		Signboards and Signs
Movable, defined325, 4		Signs:
Movable—in what buildings it may be used	369	Churches and places of worship—exit signs
School assembly halls, not permissible in except as to curtains or screens—		Dangerous buildings, form of to be posted upon
fireproofing	9-9-5	Exit. etc., in theatres—(See Theatres.)
Exception 3		Sills: Brick walls on, level, etc
Used, requirements—IV. b	319	Iron and tin-clad doors, between; requirements
Scenic Railway, Water Chute or Other Mechanical Riding, etc., Device:		Window and door; construction and
Provisions governing	367	material 597 Sinks:
Building, classification24	10p	Requirements (Class VI., tenements). 471  Skating Rinks—included under Class IV.
Close for violations of this ordinance, Power to		b240, 280, 300
Definition, and provisions governing erection and compliance with the		Not allowed above first floor306c Skeleton Construction:
building ordinance (including "portable buildings")492 to 5	511	Definition of term and provisions governing
Gas reservoir or tannery, not allowed within 500 and 600 feet of, respec-		Skylights (as ventilators)
tively	7 ½	Skylights: Class III., requirements
Class IV. a, computation for each person, where seats are not fixed 2	298	Construction—glass in
Seats: Class IV. a, number allowable296, 2		Slow-Burning Construction:
Class IV. b 3	313	Definition, materials, etc646, 647, 648 Class IV. a290, 299
Class IV. c	260	Class IV. b
Class V	381	Walls forming part of—requirements. 584
In places of amusement		Smoke-pipes: Passing through partitions; require-
Class IV. b		ments
Exhibition and exposition halls; when allowed		Plans, when to be inspected by230b
Sections Conflicting—to be governed by		Soap Factory: Frontage consents—when necessary 712
Class VI. (in respect to tenements) 4 See also Special and General provisions		Solid Masonry:
when in conflict		Definition
Class IV. b		Class IV. a
Sewerage and Drainage System Shown. 2		Class IV. b
Shafts: Construction (general provisions) 6		Space Between Aisles—(Class IV. a). 296
Definition of 4	132	Special and General Provisions—Special
Drainage of—grade 4 Enclosure (fireproof construction) 6		to govern when conflicting 242 (See also Section 433.)
Enclosing Elevators—Hospitals 2		Spectatorial Purposes—Roofs used for prohibited
Shavings and Sawdust: Storage in residences prohibited 7		Spires—(See Towers, Domes and Spires.)
Sheds, Shelter—classification246		Sprinklers—Automatic—Grain elevator, malt house, etc 675
Sheds: Open shelter—allowable height—area,		Theatre, where placed327, 393, 417  Stables—(Area of 500 square feet or
etc.; requirements when enclosed; restrictions in and outside fire-lim-		over) included in Class I 243 Included in Class III. (where less than
its		500 square feet area)240b, g. 270
navigable waters—requirements and restrictions—frontage consents		Stables and Barns—Construction—floor requirements—location, when for-
Shingle Roofs.		bidlen
See Roofs.		dinance passed governing location as to schools, churches, etc.)
Show Cases: Exhibition and exposition halls; when		Stage—(See Theatres.) Stairs and Stairways—Banquet halls,
allowed	304	provisions for (b)
Temporary seat requirements 3	360	Changes in position or construction prohibited without proper permit 679

Section	Section
Class III. requirements	(See also Class VII.)
Class III. requirements	Story—Class VII., numbering of 485
Class IV. c requirements	Class VIII., numbering of
	Street Encroachments230c
Class VI. requirements	Street—(See also Sidewalk or Street.) Street Obstructions—
or leading to sub-basement, require-	Materials on Street Regulations 610
ments         480a, c, d           Other provisions         486           Emergency (Class IV. a)         297a           Enclosures (Class II. b)         261b	Excavated material on, etc 611
Enclosures (Class II. b)	Frontage consents of adjacent own- ers
Fireproof construction—requirements., 643	Use of street and termination there- of—red right
Location, construction, number and width, in general666, 667, 668	Obstructions—permit—fee 615
Obstructions in or to prohibited467, 679	Stresses—Foundation requirements 525
Slow-burning construction-require-	Live and dead loads
ments	Metals-allowable and special require-
Stair hall, defined	ments for
and width	Thermal and shrinkage 551
to inspect annually and compel in-	Timber 539
stallation where lacking	Structural Details—Strength tests 517 Structures—Other than those specifically
291b, 292 & 294 Winders prohibited497-668	provided for in this ordinance; design and construction592a
Stairway Fire Escapes—Permit neces-	Structures over Ceiling—Class IV. b 318
sary — erection — location — specifi- cations	Class IV. c
Stalls, in Sleeping Rooms—Provisions	Cellars.)
governing 262	Sub-Cellars—(See Basements and Cellars.)
Standpipes, etc.—Amusement parks must have 366	Superintendent of Police—(See Police.) Superintendent of Streets—
Grain elevators, malt and cold storage houses 675	Occupation of streets by builders-
Standpipes and Fire Fighting Appar-	duty in re
atus—Other than on theatre build- ings—requirements—exceptions 674	Switches for Vent—Operation (Class IV. b)320c
Standpipes and Hand Pumps—Class II. c, requirements	
Standpipes and Hose—Theatres, stage	<b>T. Tanks</b> —Oils. storage of
required to have .319, 327, 346, 394, 418	Roofs—construction requirements 571
Stands—Grand	Theatres, as to
Steamer Siamese Connections—Require-	Tannery—Frontage consents—when necessary
ments 677	Six hundred foot limit from church, public or private school 617
Steel Frame Construction—(See Skeleton Construction.)	Temporary Seating Structures—Require-
Steel Rails or Beams in Foundation	ments and restrictions
Work—Concrete embedment 532 Steps—"Winders" not permitted in thea-	ments
steps in Aisles—Class IV. a. require-	and construction 446
ments 294	Alley or yard in rear; percentum of space, etc
Class IV. b	Alterations or changes in construction of existing buildings473-4-5-6-7
Class V384a, 409c	Apartments, solid masonry dividing
(See also Stairs and Stairways.) Rise and tread of V378c	wall between required; exceptions. (See also 519.)
Stone in concrete—requirements 558	Area—percentage allowed to be covered
Stone-ordinary rubble, defined 534	Basement requirements for habitable
Storage Buildings—Included in Class I240b. 243	rooms in new
Storage— Building materials on street—regula-	floor of cement
tions 610	Basements or cellars (existing buildings); living room restrictions 477
Oils	Bay window, court and vent shaft requirements
prohibited, except, etc	Bulkhead (or scuttle) in roof; construction
porting: construction 597	Ceilings over stores (buildings 3 stories or less); construction re-
Stores—Classification	quirements; courts or shafts above
essary	first story 456

Section	Section
Cellars, habitable rooms in, prohibited in new	Curtains to be incombustible; inspection and fee, etc
Walls (dividing) in apartment houses; requirements and exceptions 455 Water closet requirements; windows or artificial light (see also 443) 470 Window requirements in habitable rooms, bath, etc., and pantry 448 Terra cotta, reinforced hollow tile: Definition of term and provisions governing use	Scenery, requirements, and when not considered as "sets of"
Cement	Class V. 395 Sprinkler system requirements .227, 393, 417 Stage construction requirements (Classes IV. b and IV. cl. 316, 317, 319- 21, 324-8, 341-3, 346-8, 351-4, 390, 413 Stage fire apparatus
Construction over ceiling; requirements (if occupied by people)318, 344	26, 1911, which see at end of these building laws.

Section	Section
Vents and flues over stage; require-	Tin-clad doors—specifications and
ments	requirements
Walls of existing, and columns in; requirements374, 375	Fire walls in Class I
Woodwork to be treated with fireproof	Erection of—bracing 523 Fire walls in Class I. 249 Fire walls in auxiliary buildings to theatres and halls; Class IV. b re-
paint 413 Theatres and Halls:	Metal stack or chimney (enclosing,
Auxiliary buildings (Class IV. b), requirements 302, 303	etc.) requirements 579 Parapet, when required on walls and
Theatres and Places of Amusement—An-	porches—thickness, etc
nual inspection required; stairways and ingress and egress precautions. 237	(See also 521.)
Duty of owners as to safety 237  Thimbles—Smoke pipe requirements,	Proscenium in auditoriums of 400 or more to be masonry, etc., (Class IV.
for	b
Timber—Allowable stress, etc	Curtain walls         554           Enclosing walls         623
Quality demanded	Independent support 635
when of hreproof construction—sup-	Metal lath and cement plaster (Class I.)
ports—limitations 592 <b>Trusses</b> —(See Girders.)	Smoke flues, when forming part of —material
Turnstiles—Prohibited (Class IV. c) 336	Tenement house (apartment buildings) masonry dividing required;
U.	exceptions 455
Unclassified Buildings	Tenement (frame)—changed into from resilence; incombustible wall required (in fire limits)
Building	Terra cotta tile—use of567e
of Commissioner to have torn down	Theatres now in existence; requirements (see also 519 and columns in
Urinal Compartment in Class II. build-	walls
ing 256c	Thickness and length; construction and height
V.	Ventilating ducts, rubbish and ash chutes; construction 585
Vaudeville Theatres—Frame buildings— not allowed in after June 1, 1911	Walls, Piers and Columns—Dead and live load proportions (all classes with
285, 332, 400 Note.—Sec. 400 only, amended June	tables)
26, 1911, which see at end of building laws.	Water Closet Compartment—(Class II.)
Shows—hall for	building256c (See also Bathroom, etc.)
Vaudeville and Moving Picture Theatres—Definition and requirements.	In dwellings
Picture machine booth 345	(Class IV. c)
Vent Shafts—Class II. requirements 256 Open to sky	Widths of Corridors, Passageways, Hall-ways and Doors—(Class IV. b) 312
Tenements (new) requirements 443, 456, 458, 468	Width of Corridors, Passageways and
Ventilation—Bakeries 256d Class II., requirements 256f	Door—(Class IV. c)
Class III., rooms of	b)314a
Provision for each class 680	Wind Pressure—Resistance of struc- tures, where height exceeds twice
Tenement house, requirements as to air447, 448	least dimensions
Theatre dressing rooms	Window: Area rooming house
Dressing rooms (Class 1V.)	Area rooming house
Vents—(See Flues.) Verandas—(See Porches.)	Cleaning, safety devices for work-
Vestibule—Theatres (Class V.)391, 414	men
Floor height (Class IV. c)	VII. and VIII—metal frames-—wired
In construction may be torn down by the City	glass 572 Requirements—(Class III. & VI.) 274
Voiding of Permits 229	Sills—incombustible
w.	ing from existing
<b>Walls</b> —Altered buildings—when not of sufficient thickness—requirements 521	tilation.) Windows and Mechanical Ventilation—
Altered from residence to apartment (frame, within fire limits) incom-	Class II., requirements and excep-
bustible required between apart- ments	(See also Ventilation.)
Bay window, light court and shaft; construction	Wood Lathing and Plastering—Requirements
Between auditorium and stage, requirements; exception, Class IV. b., 316	ments
Class IV. c341, 343	Wrecking or Tearing Down Building.  Permit fee and permit and bond 224 225
Class V	Revocation of permit and bond. 234, 235
Class IV. b, division and partitions. 261 Dividing, in Class I., when required 250	У.
Dividing, iron doors in, construction requirements 573	Yard—Definition of
1010	Tenement—must have, etc 441

### CLASSIFIED LIST OF ADVERTISERS.

Advertisers are classified with a view to furnish Architects and others a ready reference list of houses engaged in the Building Business. Besides the Index to

Advertisements on pages 357-359, the nur ments appear follows directly after each nather that those using it will kindly mention the	name Classified in this list. It is requested
AIR COMPRESSORS. Page	ARCHITECTS' SPECIAL DESIGNS
Am. Steam Pump Co., 310 W. Randolph. 206 Fairbanks, Morse & Co., 900 S. Wabash. 162	(LIGHTING FIXTURES). Page Braun, David J. Mfg. Co., The, 668 W. Washington St. 160
AIR PURIFYING APPARATUS.	ARCHITECTURAL AND STRUCTURAL
Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	IRON AND STEEL.
Thomas & Smith, 116 N. Carpenter St. 216 Webster, Warren & Co., Monadnock Blk. 214	Butler St. Fdry. & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Hanke Iron & Wire Wks., Albany and
AIR VALVES.	Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216	Holmes, Pyott & Co., 159 N. Jefferson, 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194
AIR WASHERS.	Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192
Iroquois Engineering Co., 343 S. Dearborn St. 210 Thomas & Smith, 116 N. Carpenter St. 216	Lally Column Co., 175 W. Washington. 200 Morava Constr. Co., 150 S. Michigan Av. 192 Muth, Chr., Mfg. Co., 2218 Blue Island
ALPHABETICAL AND CHANGEABLE DIRECTORIES.	Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194
Tablet & Ticket Co., 624 W. Adams St. 64	Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2
AMMONIA FITTINGS.	Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52
Wolf, Fred W. Co., 827 Rees St. Inside front cover	,
ANGIES AND CHANNELS.	ARCHITECTURAL TERRA COTTA. Am. Terra Cotta & Ceramic Co., 122 S.
Butler St. Fdry. & Iron Co., 3422 Butler. 198	Michigan Av. 186 Midland Terra Cotta Co., Cham. of Com. 186
Holmes, Pyott & Co., 159 N. Jefferson, 194 Kenwood Bridge Co., 1st Nat. Bk. Bldg, 192	Northwestern Terra Cotta Co., 80 E. Jackson Blyd. Inside Front Cover
Morava Constr. Co., 150 S. Michigan Av. 192 South Halsted St. Iron Wks., 1st Nat'l	
Bank Bldg. 194 Union Fdry, Wks., 1st Nat'l Bk. Bldg, 192	ARTIFICIAL FLOWERS AND FLANTS.  Botanical Decorating Co., 504 S. 5th Av. 32
Vierling Steel Wks., 23rd & Stewart Av. 52	Butanical Decorating Co., 504 B. 5th Av. 52
AFFARATUS FOR SPREADING CEMENT AND CONCRETE.	ARTISTS' MATERIAL.  Keuffel & Esser Co., 68 W. Madison St. 264
General Cement Gun Co., 914 S. Michigan Av.	ASBESTOS FIREPROOF LUMBER.
	Johns-Manville, H. W. Co., 322 N. Michi-
ARCHITECTS' SUPPLIES.  Am. Blue Print Faper Co., 335 Plym-	gen 11.
outh Ct. 264 Abbott, A. H. & Co., 127 N. Wabash Av. 262	ASBESTOS MANUFACTURERS. Cent'l Asbestos & Magnesia Co., 25 W.
Dietzgen, Eugene Co., 166 W. Monroe. 264 Keuffel & Esser Co., 68 W. Madison St. 264	Kinzie St. 263 Johns-Manville, H. W. Co., 322 N. Michi-
ARCHITECTURAL IRON WORK.	Watson, H. F. Co., 319 Wells St. 234
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and	Western Roofing & Sup. Co., Fisher Bldg. 156
Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192	ASBESTOS PACKING Cent'l Asbestos & Magnesia Co., 25 W.
Heath-Johnson Co., 306 W. Ontario St. 263 Holmes, Pyott & Co., 159 N. Jefferson. 194	Kinzie St. 263
Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Lally Column Co., 175 W. Washington. 200	ASBESTOS—PIPE AND BOILER COVER- ING.
Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190	Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St.
Schultz, Walter L., 29 S. Clinton St. 196 South Halsted St. Iron Wks., 1st Nat'l	Johns-Manville, H. W. Co., 322 N. Michi-
Bank Bldg. 194 Standard Co., The, 2420 W. 15th St. 2	gan Av. 234 Watson, H. F. Co., 319 Wells St. 234
Standard Co., The, 2420 W. 15th St. Union Fdry. Wks., 1st Nat'l Bk. Bldg, 192 Vierling Steel Wks., 23rd & Stewart Av. 52	Western Roofing & Sup. Co., Fisher Bldg. 156
Winslow Bros. Co., 46th Av. & Harrison 196	ASPHALT FLOORS.
ARCHITECTURAL SCULPTORS.	Simpson Constr. Co., Cham. of Com. Bldg. 186
Architectural Dec. Co., 1600 S. Jefferson. 202 Decorators' Sup. Co., 2547 Archer Av. 32 Dux, Joseph, 2112 W. Van Buren St. 202	ASPHALT—FLOORS, PAVING, ROOFING.
Dux, Joseph, 2112 W. Van Buren St. 202 Plastic Relief Mfg. Co., 949 N. Halsted 202	Blome, R. S. Co., City Hall Square Bldg. 186 Heppes Co., 4505 Fillmore St. 234
•	

AUTOMATIC SPRINKLING SYSTEMS		BOILER AND GENERAL CASTINGS.	
General Fire Extinguisher Co., 108 S.	age	Butler St. Fdry. & Iron Co., 3422 Butler. 1	198
La Salle St. Ill. Malleable Iron Co., 1801 Diversey Bl.	218 210	BOILER AND FIPE COVERING. Cent'l Asbestos & Magnesia Co., 25 W.	
AWNINGS—BRONZE, WOOD AND IRO Dodge, H. B. & Co., 332 S. Michigan Av.		Kinzie St. Garden City Sand Co., Cham. of Com.	263 182
BALLAST—SLAG.		Johns-Manville, H. W. Co., 322 N. Michigan Av.	234
Ill. Improvement & Ballast Co., 72 W. Adams St.	188	Watson, H. F. Co., 319 Wells St. Western Roofing & Sup. Co., Fisher	234 156
BANK AND OFFICE FIXTURES. Baumann, F. O. Mfg. Co., 1501 Smith Av.	38		100
Brunswicke-Balke-Collender Co., 328 S. Wabash Av. Plamondon & Tetze Co., 32 S. Clinton.	6 38	Boiler Setting  Baldwin, M. E., Constr. Co., 140 S. Dearborn St.	266
		BOILERS-STEAM AND HOT WATER	
Hanke Iron & Wire Wks., Albany and Chicago Aves.	266 196	Fairbanks, Morse & Co., 900 S. Wabash. III. Malleable Iron Co., 1801 Diversey Bl. 5	210
Heath-Johnson Co., 306 W. Ontario St. Smith. F. P., W. & I. Wks., 56 W. Lake Standard Co. The, 2420 W. 15th St. Winslow Bros. Co., 46th Av. & Harrison	200	Kirk, Geo. H., 6711 Wentworth Av.	$\frac{268}{218}$
BANKERS.		Reading, W. D. Heating Co., 39 S. La	212 212
Corn Exch. Nat'l Bank, 134 S. La Salle.	22	Salle St. Western Valve Co., 188 N. Market St.	$\frac{268}{263}$
Mott, J. L., Iron Wks., 104 S. Michigan.	14	BONDS.	
BATH TUBS.  Mott, J. L., Iron Wks., 104 S. Michigan.	14	Ill. Surety Co., 134 S. La Salle St. Maryland Casualty Co., Cham. of Com.	64
BEAMS AND COLUMNS—IRON AND		Bldg. Title Guaranty & Surety Co., 209 S. La	64
STEEL		Salle St U. S. Fidelity & Guaranty Co., 134 S.	262
Butler St. Fdry. & Iron Co., 3422 Butler. Halsted, Joseph, Co., 1233 W. Randolph Holmes. Pyott & Co., 159 N. Jefferson.	198 192 194	La Salle St.	64
Kenwood Bridge Co., 1st Nat. Bk. Bldg. Morava Constr. Co., 150 S. Michigan Av. Muth, Chr., Mfg. Co., 2218 Blue Island Av.	192	BOWLING ALLEYS.  Brunswicke-Balke-Collender Co., 328 S. Wabash Av.	6
South Halsted St. Iron Wks., 1st Nat'l Bank Bldg.	194	BRACKETS. Braun, David J. Mfg. Co., The, 668 W.	
Smith, F. P., W. & I. Wks., 56 W. Lake Union Fdry, Wks., 1st Nat'l Bk. Bldg. Vierling Steel Wks., 23rd & Stewart Av.	$\frac{200}{192}$	Washington St.	160
	52	BRASS GOODS. Heath-Johnson Co., 306 W. Ontario St.	263
Altizer Elevator Co., 609 La Salle Av.	26	BRASS AND IRON—ARCHITECTURA	T.,
Otis Elevator Co., 600 W. Jackson Bl. BILLIARD TABLES.	24	Butler St. Fdry. & Iron Co., 3422 Butler. Chicago Ornamental Iron Co., 37th &	198
Brunswicke-Balke-Collender Co., 328 S. Wabash Av.	6	Hanke Iron & Wire Wks., Albany and	196
BILLIARD ROOM SUPPLIES.	v	Heath-Johnson Co., 306 W. Ontario St.	$\begin{array}{c} 196 \\ 263 \end{array}$
Brunswicke-Balke-Collender Co., 328 S. Wabash Av.	6	Smith. F. P., W. & I. Wks., 56 W. Lake Standard Co., The, 2420 W. 15th St. Winslow Bros. Co., 46th Av. & Harrison	$^{2}$
BLACK PLATE.		BRASS, IRON AND WIRE.	
Follansbee Bros. Co., 72 W. Adams St. and Pittsburgh, Pa.	60	Hanke Iron & Wire Wks., Albany and Chicago Aves.	196
BLOWER REGULATORS.		Halsted, Joseph, Co., 1233 W. Randolph Smith. F. P., W. & I. Wks., 56 W. Lake	$\frac{192}{200}$
Davis, G. M. Regulator Co., 422 Milwaukee Av.	216	Standard Co., The, 2420 W. 15th St. Vierling Steel Wks., 23rd & Stewart Av.	$\frac{2}{52}$
Am. Blue Print Paper Co., 335 Plym-		BREWERY AND MALT HOUSE CON	r-
outh Ct. Crofoot, Nielsen & Co., 180 W. Washington St.	264 264	STRUCTION.  Kaestner & Hecht Co., 500 S. Throop St.	24
Dietzgen, Eugene Co., 166 W. Monroe. Keuffel & Esser Co., 68 W. Madison St.	264	BRICK BUILDING RAISERS AND MOVERS.	
BOILERS.		Brown, Wm. H. & Co., 5643 S. Halsted. Friestedt, L. P. Co., Tribune Bldg.	58 58
Arcade Steam Heating Co., 118 W. Kin- zie St.	268	Sheeler & Son Co., Cham. of Com. Bldg.	58
Fairbanks, Morse & Co., 900 S. Wabash, Ill. Malleable Iron Co., 1801 Diversey Bl. Iroquois Engineering Co., 343 S. Dear-	162	BRICK—COMMON. Curtis Brick Co., Cham. of Com. Bldg. Ill. Brick Co., Cham. of Com. Bldg.	267 170
born St. Kaestner & Hecht Co., 500 S. Throop St.	$\frac{210}{24}$	Moulding, Thomas, Co., Cham. of Com.	
Kehm Bros. Co., 15 W. Kinzie St. Prentice, L. H. Co., 330 Sherman St.	208 212	Wisconsin Lime & Cement Co., Chamber of Commerce 178-	

BRICK—ENAMELED. Page	BUILDING LOANS. Page
Bonner & Marshall Co., Cham, of Com. 260 Hydraulic Press Brick Co., Cham, of	Greenebaum Sons Bank & Trust Co., 155 N. Clark St. 220
Com. Bldg. 260 Jenkins & Reynolds Co., Cham. of Com. 260 Kimbell, S. S. Brick Co., Cham. of Com. 260 McLaughlin Building Material Co., 9 S. La Salle St. 170	BUILDING MATERIALS.  Garden City Sand Co., Cham. of Com. 182 McLaughlin Building Material Co., 9 S. La Salle St. Northwestern Terra Cotta Co., 80 E.
BRICK—FACING.  Bonner & Marshall Co., Cham. of Com. Hydraulic Press Brick Co., Cham. of Com. Bldg. Jenkins & Reynolds Co., Cham. of Com. Kimbell, S. S. Brick Co., Cham. of Com. 260 Moulding, Thomas, Co., Cham. of Com. 260	Jackson Blyd. Inside Front Cover Wisconsin Lime & Cement Co., Chamber of Commerce 178-266  BUILDING PAPERS. Barrett Mfg. Co., 38 S. Dearborn St. 20
Wisconsin Lime & Cement Co., Chamber of Commerce 178-260	Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St. 263 Paine Lumber Co., Otis Bldg. Inside Back Cover
BRICK—FIRE.  Curtis Brick Co., Cham. of Com. Bldg. 267 Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Lowry, Albert J., Cham. of Com. Bldg. 170 Moulding, Thomas, Co., Cham. of Com. 260	Standard Paint Co., The, 122 S. Michigan Av. 228 Watson, H. F. Co., 319 Wells St. 231 Western Roofing & Sup. Co., Fisher Bldg. 156
BRICK—PAVING.	BUILDING RAISERS AND MOVERS.
Bonner & Marshall Co., Cham. of Com. 260 Curtis Brick Co., Cham. of Com. Bidg. 267 Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260	Brown, Wm. H. & Co., 5643 S. Halsted. 58 Friestedt, L. P. Co., Tribune Bldg. 58 Sheeler & Son Co., Cham. of Com. Bldg. 58
McLaughlin Building Material Co., 9 S. La Salle St.	BULLETIN BOARDS.  Tablet & Ticket Co., 624 W. Adams St. 64
Moulding, Thomas, Co., Cham. of Com. 260	
BRICK—PRESSED.  Bonner & Marshall Co., Cham, of Com. 260 Hydraulic Press Brick Co., Cham. of Com. Bldg. Jenkins & Reynolds Co., Cham. of Com. 260	CABINET WORK.  Brunswicke-Balke-Collender Co., 328 S. Wahash Av. Plamondon & Tetze Co., 32 S. Clinton. 38
Kimbell, S. S. Brick Co., Cham. of Com. 260 McLaughlin Building Material Co., 9 S. La Salle St. 170 Moulding, Thomas, Co., Cham. of Com. 260 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260	CABLES.  Macomber & Whyte Rope Co., 507 S. Clinton St. 267
ber of commerce	Braun, David J. Mfg. Co., The, 668 W. Washington St. 160
BRICK SAND MOULD  Bonner & Marshall Co., Cham. of Com. Press Brick Co., Cham. of Com. Bldg. 260  Jenkins & Reynolds Co., Cham. of Com. 260  Kimbell, S. S. Brick Co., Cham. of Com. 260	CANOPIES—IRON AND BRONZE. Standard Co., The, 2420 W. 15th St, 2 Winslow Bros. Co., 46th Av. & Harrison 196  CARPENTER CONTRACTORS.
BRICK SEWER.  Ill. Brick Co., Cham. of Com. Bldg. 170 Nat'l Brick Co., 118 N. La Salle St. 170	Anderson, A. & E. Co., 19 S. La Salle St. 48 Appel, Henry & Son Co., 179 W. Wash- ington St. 48 Bent, E. M. Co., 189 W. Madison St. 44 Black, James, Masonry & Contracting
Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192 Strobel Steel Constr. Co., Monadnock 198	Co., 212 W. Washington St. 42 Bulley & Andrews, 25 N. Dearborn St. 267 Cadenhead Co., 9 S. La Salle St. 50 Carden-Callahan Co., 332 S. Michigan Av. 56 Carson, C. E. Co., 139 N. Clark St. 56
BRIDGES—STEEL. Westcott & Ronneberg, 1049 Otis Bldg. 250	Chaney-Archibald Co., 189 W. Madison. 56 Clark, C. Everett Co., 69 W. Washing- ton St. 46
Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Heath-Johnson Co., 306 W. Ontario St. 263 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The. 2420 W. 15th St. 2 Winslow Bros. Co., 46th Av. & Harrison 196  BUILDING DIRECTORIES.	Cullen, Geo. P., 128 N. La Salle St. 265 Doherty, Frank E., Cham. of Com. Bldg. 267 Dowling & Rutherford, 54 W. Randolph 267 Ericsson, Henry Co., 139 N. Clark St. 156 Ewen, John M. Co The Rookery 46 Fuller, Geo. A. Co., Marquette Bldg. 42 Gilsdorff Bros. Co., 154 W. Randolph St. 266 Gindele, Chas, W. Co., 3333 La Salle St. 46 Griffiths, John & Son Co., 112 W. Adams St. 40
Tablet & Ticket Co., 624 W. Adams St. 64  BUILDERS' HARDWAR™.	Hendry, Alex., 320 W. Indiana St. 266 Hinchliff, Geo. Co., 189 W. Madison St. 52 Leonard Constr. Co., 332 S. Michigan Av. 48 Lund, Abraham Co., 610 Security Bldg. 48
Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St. 30	Martin Constr. Co., 82 W. Washington. 266 Mayor, Wm. Co., 38 S. Dearborn St. 50 McKeown Bros., 4819 Cottage Grove Av. 54 Meiling & Co., 139 N. Clark St. 265 Menke-Thielberg Co., 139 N. Clark St. 54

Page	CEMENT GUN FOR APPLYING CEMENT
Meyne, Gerhardt F., 127 N. Dearborn St. 266	AND CONCRETE ON ANY SURFACE.
Morrice & Barron, 17 N. La Salle St. 265 Nicholson, Zimmerman & Co., 133 W.	Page
	General Cement Gun Co., 914 S. Mich-
Washington St. 50 Nellau & Wolff Mfg. Co., 1705 Fuller-	igan Av. 182
ton Av. 34	CEMENT—HYDRAULIC.
Olson, A. & J., 6 N. Clark St. 266	
Olson Bros., 6501 Peoria St. 44	Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260
Olson & Brockhausen Co., 19 S. La	Moulding, Thomas, Co., Cham. of Com. 260
Salle St. 56 Paschen Bros., 25 N. Dearborn St. 54	
Pillinger W A Co 118 V In Salla 50	CEMENT—MANUFACTURERS.
Regnell, B. J. Co., 189 W. Madison St. 265 Scharmer, Jacob Co., 179 W. Washinston 44	Atlas Portland Cement Co., 134 S. La
Scharmer, Jacob Co., 179 W. Washington 44	Salle St. 182 Chicago Portland Cement Co., 30 N. La
Shedden, James & Co., 106 N. La Salle 50 Sollitt. Ralph & Sumner Co., 79 E.	Salle St. 184
Adams St. 52	de Smet, Geo. W., Cham. of Com. Bldg. 28
Snyder, J. W., Peoples Gas Bldg. 42	Marquette Cement Mfg. Co., 140 S.
Stewart, James & Co., 343 S. Dearborn St. 40	Dearborn St. 184
Strandberg, E. P., Co., 5010 S. Wabash	Peerless Portland Cement Co., Union City, Mich. 184
Av. Stressenreuter Bros., Cham. of Com. 265	Universal Portland Cement Co., 72 W.
Thompson-Starrett Co., Fisher Bldg. 42	Adams St. 178
Todd. James & Co., 9 S. La Salle St. 267	CEMENT PAVING AND FLOORS.
Wells Bros. Co., 53 W. Jackson Blvd. 40	
CARRIES ASP BASS	Blome, R. S. Co., City Hall Square Bldg, 186 Cooper, S. L. & Co., 155 N. Clark St. 265
CARPETS ASD RUGS	Simpson Constr. Co., Cham. of Com. Bldg. 186
Carson, Pirie, Scott & Co., Chicago. 232	
CARVING.	CEMENT—PORTLAND.
Dux, Joseph, 2112 W. Van Buren St. 202	Atlas Portland Cement Co., 134 S. La
Dan voceput 2112 it. tait Daten 51. 202	Salle St. Chicago Portland Cement Co., 30 N. La
CAST IRON FENCE POSTS.	Salle St. 184
Reder Fdry Co., 2125 Canalport Av. 266	de Smet, Geo. W., Cham. of Com. Bldg. 28
	Garden City Sand Co., Cham. of Com. 182
CASTINGS-GENERAL.	Jenkins & Reynolds Co., Cham. of Com. 260
Butler St. Fdry. & Iron Co., 3422 Butler, 198	Marquette Cement Mfg. Co., 140 S. Dearborn St. 184
Reder Fdry Co., 2125 Canalport Av. 266	Meacham & Wright Co., 134 S. La Salle. 184
CACTA T FTT TITCHEN	Moulding, Thomas, Co., Cham. of Com. 260
CASUALTY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S.	Peerless Portland Cement Co., Union
La Salle St. 64	City, Mich. Universal Portland Cement Co., 72 W.
31	Adams St. 178
CEILING LIGHTS	Wisconsin Lime & Cement Co., Cham-
Braun, David J. Mfg. Co., The, 668 W.	ber of Commerce 178-269
Washington St. 160	CEMENT SIDEWALKS, PAVING AND
CEILINGS-ORNAMENTAL STEEL.	FLOORS.
Bremer, H. F., 2229 Ogden Av. 62	Blome, R. S. Co., City Hall Square Bldg, 186
Krefting, E., 622 W. Van Buren St. 62	Cooper, S. L. & Co., 155 N. Clark St. 265
McFarland-Hyde Co., 2701 5th Av. 62	Simpson Constr. Co., Cham. of Com. Bldg. 186
Miller, James A. & Bro., 114 S. Clinton, 62	CEMENT AND CONCRETE CONSTRUC-
CRITINGS SUSPENDED SPANNER	TION.
CEILINGS—SUSPENDED, GROINED AND ARCHED.	Blome, R. S. Co., City Hall Square Bldg. 186
Ill. Terra Cotta Lumber Co., Rookery. 150	Chancy-Archibald Co., 189 W. Madison, 56
Nat'l Fire Proofing Co., 72 W. Adams. 180	Simpson Constr. Co., Cham. of Com. Bldg. 186
	CEMENT TESTING.
CEMENT.	Am. Bureau of Inspection and Tests,
Atlas Portland Cement Co., 134 S. La	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250
Atlas Portland Cement Co., 134 S. La Salle St. 182	Am. Bureau of Inspection and Tests,
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 N. La	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt, W. & Co., 209 S. La Salle, 250
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 X. La Salle St. 184 de Smet, Geo. W., Cham, of Com. Eldg. 28	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt, W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC.
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 N. La Salle St. 184 de Smet, Geo. W., Cham, of Com. Bldg. 28 Garden City Sand Co., Cham, of Com. 182	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 N. La Salle St. 184 de Smet, Geo. W., Cham, of Com. Eldg. 28 Garden City Sand Co., Cham, of Com. 182 Jenkins & Reynolds Co., Cham, of Com. 260	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 N. La Salle St. 184 de Smet, Geo. W., Cham. of Com. 184 Garden City Sand Co., Cham. of Com. 260 Jenkins & Reynolds Co., Cham. of Com. 260 Marquette Cement Mfg. Co., 140 S.	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  Salle St.  de Smet, Geo. W., Cham. of Com. Eldg. Garden City Sand Co., Cham. of Com.  Jenkins & Reynolds Co., Cham. of Com.  Jenkins & Reynolds Co., 140 S. Dearborn St.  McLaughlin Building Material Co., 9 S.	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184 CHANDELIERS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. Salle St. Ge Smet. Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. 170	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250 CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184
Atlas Portland Cement Co., 134 S. La Salle St. 182 Chicago Portland Cement Co., 30 N. La Salle St. 184 Sarden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Marquette Cement Mfg. Co., 140 S. Dearborn St. 184 McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  de Smet, Geo. W., Cham. of Com. Bldg. 25 Garden City Sand Co., Cham. of Com. 260 Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 174 Peerless Portland Cement Co., Union	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND
Atlas Portland Cement Co., 134 S. La Salle St.  Chicago Portland Cement Co., 30 N. La Salle St.  de Smet. Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com.  Jenkins & Reynolds Co., Cham. of Com.  Jenkins & Reynolds Co., Cham. of Com.  Marquette Cement Mfg. Co., 140 S. Dearborn St.  McLaughlin Building Material Co., 9 S.  La Salle St.  Meacham & Wright Co., 134 S. La Salle.  Neerless Portland Cement Co., Union City. Mich.  Universal Portland Cement Co., 72 W.	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS. Braun. David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND BULLETINS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. 4 Salle St. 6 Smet, Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 170 Meacham & Wright Co., 134 S. La Salle. 184 Peerless Portland Cement Co., 72 W. Adams St. 178	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt. Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND
Atlas Portland Cement Co., 134 S. La Salle St.  Chicago Portland Cement Co., 30 N. La Salle St.  de Smet. Geo. W., Cham, of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St.  McLaughlin Building Material Co., 9 S. La Salle St.  Meacham & Wright Co., 134 S. La Salle. Neerless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St.  Wisconsin Lime & Cement Co., Cham-	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC.  Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun, David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. 64  CHEMISTS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. 4 Salle St. 6 Smet, Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 170 Meacham & Wright Co., 134 S. La Salle. 184 Peerless Portland Cement Co., 72 W. Adams St. 178	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt. W. & Co., 209 S. La Salle. 250  CEMENT—UTICA HYDRAULIC.  Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun, David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. 64  CHEMISTS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  de Smet, Geo. W. Cham. of Com. Bldg. 28 Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 184 Peerless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Chamber of Commerce	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 53 W. Jackson Blvd. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Meacham & Wright Co., 134 S. La Salle.  CHANDELIERS. Braun. David J. Mfg. Co., The, 668 W. Washington St.  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St.  CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  de Smet, Geo. W. Cham. of Com. Bldg. 25 Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Bullding Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. Peerless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Chamber of Commerce  CEMENT—AMERICAN AND IMPORTED.	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 52 W. Jackson Blvd. 250  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle.  CHANDELIERS. Braun, David J. Mfg. Co., The, 668 W. Washington St.  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt. W. & Co., 209 S. La Salle.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. Ge Smet. Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 184 Peerless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Chamber of Commerce  CEMENT—AMERICAN AND IMPORTED. Garden City Sand Co., Cham. of Com. 182 Garden City Sand Co., Cham. of Com. 260	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 53 W. Jackson Blvd.  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Meacham & Wright Co., 134 S. La Salle.  CHANDELIERS. Braun. David J. Mfg. Co., The, 668 W. Washington St.  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. Hunt, Robt. W. & Co., 209 S. La Salle.  CHIMNEY TOPS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  de Smet. Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. Meacham & Wright Co., 134 S. La Salle. Neacham & Wright Co., 134 S. La Salle. Nieceless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Cham. ber of Commerce  CEMENT—AMERICAN AND IMPORTED. Garden City Sand Co., Cham. of Com.  152	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 55 W. Jackson Blvd.  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. 64  CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt. W. & Co., 209 S. La Salle. 250  CHIMNEY TOPS.  Northwestern Terra Cotta Co., 80 E.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St.  de Smet, Geo. W., Cham, of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. Meacham & Wright Co., 134 S. La Salle. 170 Niersal Portland Cement Co., Cham. City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Cham. ber of Commerce  CEMENT—AMERICAN AND IMPORTED. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle.	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 53 W. Jackson Blvd.  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Meacham & Wright Co., 134 S. La Salle.  CHANDELIERS. Braun. David J. Mfg. Co., The, 668 W. Washington St.  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. Hunt, Robt. W. & Co., 209 S. La Salle.  CHIMNEY TOPS.
Atlas Portland Cement Co., 134 S. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. Chicago Portland Cement Co., 30 N. La Salle St. Ge Smet. Geo. W., Cham. of Com. Bldg. Garden City Sand Co., Cham. of Com. Jenkins & Reynolds Co., Cham. of Com. Marquette Cement Mfg. Co., 140 S. Dearborn St. McLaughlin Building Material Co., 9 S. La Salle St. Meacham & Wright Co., 134 S. La Salle. 184 Peerless Portland Cement Co., Union City. Mich. Universal Portland Cement Co., 72 W. Adams St. Wisconsin Lime & Cement Co., Chamber of Commerce  CEMENT—AMERICAN AND IMPORTED. Garden City Sand Co., Cham. of Com. 182 Garden City Sand Co., Cham. of Com. 260	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. The, 55 W. Jackson Blvd.  CEMENT—UTICA HYDRAULIC. Garden City Sand Co., Cham. of Com. 182 Jenkins & Reynolds Co., Cham. of Com. 260 Meacham & Wright Co., 134 S. La Salle. 184  CHANDELIERS.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160  CHANGEABLE DIRECTORIES AND BULLETINS.  Tablet & Ticket Co., 624 W. Adams St. 64  CHEMISTS.  Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250 Hunt, Robt. W. & Co., 209 S. La Salle. 250  CHIMNEY TOPS.  Northwestern Terra Cotta Co., 80 E.

CLOTHES DRYERS.	CONDUITS AND FITTINGS.
Am. Laundry Machinery Co., 208 W. Monroe St. 236 Chicago Dryer Co., 630 S. Wabash Av. 236	Central Electric Co., 320 S. 5th Av. 104 Western Electric Co., 500 S. Clinton St. 162
Troy Laundry Machy. Co., 23rd and La Salle Sts. 236	CONTRACTORS' BONDS.  Ill. Surety Co., 134 S. La Salle St. 64 Maryland Casualty Co., Cham. of Com.
CLUSTERS, WIRELESS—STANDARD AND SEPARABLE.	Bldg. 64 Title Guaranty & Surety Co., 200 S. La
Benjamin Electric Mfg. Co., 120 S. Sangamon St. 160 Central Electric Co., 320 S. 5th Av. 164 Western Electric Co., 500 S. Clinton St. 162	Salle St. 262  CONTRACTORS AND BUILDERS. Anderson, A. & E. Co., 19 S. La Salle St. 48 Appel, Henry & Son Co., 179 W. Wash-
COAL DOCK TOWERS.	ington St. Bent, E. M. Co., 189 W. Madison St. 48
Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244	Black, James, Masonry & Contracting Co., 212 W. Washington St. 42 Bulley & Andrews, 25 N. Dearborn St. 267 Cadenhead Co., 9 S. La Salle St. 50
COAL HANDLING MACHINERY FOR POWER PLANTS.	Carden-Callahan Co., 332 S. Michigan Av. 56
Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 241 Link Belt Co., 39th & Stewart Av. 244 Olson Bros. & Co., 2418 Bloomingdale Av. 246 Weller Mfg. Co., 853 E. North Av. 246  COLD DRAWN STEEL TRIM.	Carson, C. E. Co., 139 N. Clark St. Chaney-Archibald Co., 189 W. Madison. Clark, C. Everett Co., 69 W. Washington St. Cullen, Geo. P., 128 N. La Salle St. Doherty, Frank E., Cham. of Com. Bldg. 267 Dowling & Rutherford, 54 W. Randolph 267 Ericsson, Henry Co., 139 N. Clark St. Ewen, John M., Co., The Rookery Falkenau Constr., Co., 30 N. La Salle St. Fuller, Geo. A. Co., Marquette Bldg.
Dahlstrom Metallic Door Co., 53 W. Jackson Blvd.  COLUMNS STEEL CONCRETE MILLER	Gilsdorff Bros. Co., 154 W. Randolph St. 266 Gindele, Chas, W. Co., 3333 La Salle St. 46 Griffiths, John & Son Co., 112 W. Adams
COLUMNS, STEEL—CONCRETE FILLED.  Lally Column Co., 175 W. Washington. 200	St. 40 Hendry, Alex., 320 W. Indiana St. 266 Hinchliff, Geo. Co., 189 W. Madison St. 52
COMPOSITION FOR EXTERIOR AND INTERIOR—ORNAMENTAL	Lanquist & Illsley Co., 1100 N. Clark St. 44 Leonard Constr. Co., 332 S. Michigan Av. 48 Lund, Abraham Co., 610 Security Bldg. 48
Architectural Dec. Co., 1600 S. Jefferson, 202 Decorators' Sup. Co., 2547 Archer Av. 32 Plastic Relief Mfg. Co., 949 N. Halsted 202	Martin Constr. Co., \$2 W. Washington. 266 Mayor, Wm. Co., 38 S. Dearborn St. 50 McKeown Bros., 4819 Cottage Grove Av. 54 Meiling & Co., 139 N. Clark St. 265
CONCRETE CONSTRUCTION.	Menke-Thielberg Co., 130 N. Clark St. 54 Meyne, Gerhardt F., 127 N. Dearborn St. 266
Blome, R. S. Co., City Hall Square Bldg. 186 Concrete-Steel Products Co., McCormick Bldg. 176 Cooper, S. L. & Co., 155 N. Clark St. 265 Gabriel Reinforcement Co., Detroit, Mich. 263 Raymond Concrete Pile Co., 111 W. Monroe St. 182 Simpson Constr. Co., Cham. of Com. Bldg. 186 Stewart, James & Co., 343 S. Dearborn St. 40	Morava Constr. Co., 150 S. Michigan Av. 192 Morrice & Barron, 17 N. La Salle St. 265 Nicholson, Zimmerman & Co., 133 W. Washington St. Olson, A. & J., 6 N. Clark St. Olson Bros., 6501 Peoria St. Olson & Brockhausen Co., 19 S. La Salle St. Paschen Bros., 25 N. Dearborn St. 53
CONCRETE FILES.	Pillinser, W. A. Co., 118 N. La Salle, 54 Regnell, B. J. Co., 189 W. Madison St. 265 Redatz, Jacob, The Rookery, 265
Raymond Concrete Pile Co., 111 W. Monroe St. 182  CONCRETE—REINFORCED.  Concrete-Steel Products Co., McCormick Bldg. 176 Westcott & Ronneberg, 1049 Otis Bldg. 250	Scharmer, Jacob Co., 179 W. Washington 44 Shedden, James & Co., 106 N. La Salle Sollitt. Ralph & Sumner Co., 79 E. Adams St. 52 Snyder, J. W., Peoples Gas Bldg. 42 Stewart, James & Co., 343 S. Dearborn St. 40 Strandberg, E. P., Co., 5010 S. Wabash AV. 265
CONCRETE REINFORCING BARS.	Stressenreuter Bros., Cham. of Com. 265
Concrete-Steel Products Co., McCormick Bldg. 176 Gabriel Reinforcement Co., Detroit, Mich. 263	Thompson-Starrett Co., Fisher Bldg, 42 Todd, James & Co., 9 S. La Salle St. 267 Wells Bros. Co., 53 W. Jackson Blvd. 40
CONCRETE REINFORCING BAR STEEL.	CONTRACTORS' SUPPLIES.  Macomber & Whyte Rope Co., 507 S.
Am. Steel & Wire Co., 72 W. Adams St. 14 Concrete-Steel Products Co., McCor- mick Bldg. 176	Clinton St. 267  CONVEYORS—SPIRAL STEEL.
CONCRETE REINFORCING STEEL	Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244
FABRIC.  Northwestern Expanded Metal Co., 37 W. Van Buren St. 10	Link Belt Co., 39th & Stewart Av. 244 Olson Bros. & Co., 2418 Bloomingdale Av. 246 Weller Mfg. Co., 853 E. North Av. 246
CONCRETE—SLAG.	
Ill. Improvement & Ballast Co., 72 W. Adams St. 188	COOKING APPARATUS. Schneider & Trenkamp Co., 315 S. Wabash Av. and Cleveland, Ohio 174

COOLING SYSTEMS FOR BUILDINGS. Page	DEADENING FELT—QUILT. Page
Narowetz Heating & Ventilating Co.,	Cabot, Samuel, 350 Dearborn Av. 226
223 W. Lake St. 208 Thomas & Smith, 116 N. Carpenter St. 216 Webster, Warren & Co., Monadnock Blk. 214	<b>DEADENING MATERIAL.</b> Johns-Manville, H. W. Co., 322 N. Michi-
COPING.	gan Av. 234 Union Fibre Co., Great Northern Bldg. 234
Northwestern Terra Cotta Co., 80 E.	emon Tibre con, areat from play, 201
Jackson Blvd. Inside Front Cover  CORNER BEAD METAL.	DECORATORS.  Brand, Gustave A. & Co., 1428 Michigan Av.
Wisconsin Lime & Cement Co., Chamber of Commerce 178-260	Carson, Pirie, Scott & Co., Chicago. 232 Eckart J. F. Co., 105 S. Dearborn St. 262
CORNICES-COPPER, GALVANIZED.	Nelson, W. P., Co., 614 S. Michigan Av. 230
Bremer, H. F., 2229 Ogden Av 62	Noelle, J. B. Co., 179 W. Washington, 242 Nyden & Thunander, 2960 Michigan Av. 232
Knisely, Harry C., Co., 1908 S. Western	Scheuren, Jos. M., 5 N. Wabash Av. 230
Av. Krefting, E., 622 W. Van Buren St. 62	Spierling & Linden, 1216 Michigan Av. 230 Sturdy, Joseph F., 824 S. Michigan Av. 232
McFarland-Hyde Co., 2701 5th Av. 62	•
Miller, James A. & Bro., 114 S. Clinton. 62	DECORATORS—THEATRE. Brand, Gustave A. & Co., 1428 Michi-
CORNICE MAKERS' ORNAMENTS.	gan Av. 230
Knisely, Harry C., Co., 1908 S. Western	Carson. Pirie, Scott & Co., Chicago. 232 Eckart, J. F. Co., 105 S. Dearborn St. 262
Av. 60	McCarthy, E. J. Co., 180 N. Dearborn 262
CORNICE WORK.	McCarthy, E. J. Co., 180 N. Dearborn 262 Nelson, W. P. Co., 614 S. Michigan Av. 230 Noelle, J. B. Co., 179 W. Washington, 242 Nyden & Thunander, 2960 Michigan Av. 232 Scheuren, Jos. M., 5 N. Wabash Av. 230
Bremer, H. F., 2229 Ogden Av. 62 Knisely, Harry C., Co., 1908 S. Western	Noelle, J. B. Co., 179 W. Washington, 242 Nyden & Thunander, 2960 Michigan Av. 232 Scheuren, Jos. M., 5 N. Wabash Av. 230
AV. 60	Scheuren, Jos. M., 5 N. Wabash Av. 230 Spierling & Linden, 1216 Michigan Av. 230
Krefting, E., 622 W. Van Buren St. 62 McFarland-Hyde Co., 2701 5th Av. 62	Sturdy, Joseph F., 824 S. Michigan Av. 232
Miller, James A. & Bro., 114 S. Clinton. 62	DIRECTORIES.
CORRUGATED IRON.	Tablet & Ticket Co., 624 W. Adams St. 64
McFarland-Hyde Co., 2701 5th Av. 62	DOMESTIC WATER SYTEMS.
Miller, James A. & Bro., 114 S. Clinton. 62	Fairbanks, Morse & Co., 900 S. Wabash, 162
COTTON TWINES.	DOORS.
Samson Cordage Wks., 15 E. Lake St. 264	Curtis Door & Sash Co., 2355 Blue Island Av.
CRUSHED STONE DEALERS.	Morgan Sash & Door Co., Blue Island
McLaughlin Building Material Co., 9 S. La Salle St.	Av. and Wood St. Inside Back Cover Nollau & Wolff Mfg. Co., 1705 Fuller-
Wisconsin Lime & Cement Co., Cham-	ton Av. Paine Lumber Co., Otis Bldg.
ber of Commerce 178-260	Inside Back Cover
CUREING-OOLITIC LIME STONE.	DOORS-CROSS HORIZONTAL FOLDING.
Indiana Quarries Co., 112 W. Adams St. 1	Ross, R. J. Mfg. Co., 20th and Western Av.
CUT STONE CONTRACTORS.	Variety Mfg. Co., 2958 Carroll Av. 198
Ward, Albert J. Co., Fullerton Av.	DOORS-CROSS IMPROVED MEAKER.
Bridge Wilde & Schmidt, 21st, W. of Marshall	Variety Mfg. Co., 2958 Carroll Av. 198
Blvd. 262	DOORS-FLUSH VENEERED
CUTLERY AND TOOLS.	Morgan Sash & Door Co., Blue Island Av. and Wood St. Inside Back Cover
Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264	DOOR HANGERS-BALL BEARING
Orr & Lockett Hardware Co., 14 W.	NOISELESS.
	Winslow Bros. Co., 46th Av. & Harrison 196
DAMP COURSES. Blome, R. S. Co., City Hall Square Bldg. 186	DOORS-HOLLOW METAL.
Standard Paint Co., The, 122 S. Michi-	Sykes Co., The, 930 W. 19th Pl. 60
gan Av. 228	DOOR MATS—RUBBER AND STEEL
DAMP RESISTING COMPOUNDS.	Carson, Pirie, Scott & Co., Chicago. 232
Barrett Mfg. Co., 38 S. Dearborn St. 20	Dodge, H. B. & Co., 332 S. Michigan Av. 190
Ceresit Waterproofing Co., Com. Nat. Bank Bldg.	
Chicago Ironite Water Proofing Co., 118 N. La Salle St. 28	Morgan Sash & Door Co., Blue Island
de Smet, Geo. W., Cham. of Com. Bldg. 28	Av. and Wood St. Inside Back Cover
Ill. Damp Proofing Co., 3953 Lowe Av. 30 Standard Paint Co., The, 122 S. Michi-	Paine Lumber Co., Otis Bldg. Inside Back Cover
gan Av.	DRAINAGE,
Toch Brothers, 133 W. Washington St. 28	Am. Heating & Plumbing Corp., 508 S.
DEADENING FELTS.	Canal St. 220 Murpay-Keeley Co., 23 E. Congress St. 268
Barrett Mfg. Co., 38 S. Dearborn St. 20	Nacey, P. Co., 927 S. State St. 156
Cabot, Samuel, 350 Dearborn Av. 226 Union Fibre Co., Great Northern Bldg. 234	Nilson Bros., 3222 N. Halsted St. 220 Noble & Thumm, 2313 Lincoln Av. 268
Watson, H. F. Co., 319 Wells St. 234	Stein, Carl John 853 S. State St. 216

DRAPERIES.	Commonwealth Edison Co. 180 W
Carson, Pirie, Scott & Co., Chicago. 232 McCarthy, E. J. Co., 180 N. Dearborn 262 Nelson, W. P., Co., 614 S. Michigan Av. 230 Nyden & Thunander, 2960 Michigan Av. 232 Scheuren, Jos. M., 5 N. Wabash Av. 230 Spierling & Linden, 1216 Michigan Av. 230 Sturdy, Joseph F., 824 S. Michigan Av. 232	Commonwealth Edison Co., 120 W. Adams St. 168 Fairbanks, Morse & Co., 900 S. Wabash. 162 Freeman-Sweet Co., 538 S. Dearborn St. 158 Kohler Bros., 343 S. Dearborn St. 158 Newgard, Henry & Co., 947 Wash. Bl. 158 Western Electric Co., 500 S. Clinton St. 162 White City Electric Co., 229 W. Van
DRAWING MATERIALS.	Buren St. 158
Am. Blue Print Paper Co., 335 Plymouth Ct. Abbott, A. H. & Co., 127 N. Wabash Av. 262 Dietzgen, Eugene Co., 166 W. Monroe. 264 Keuffel & Esser Co., 68 W. Madison St. 264	ELECTRIC SWITCHES.  Central Electric Co., 320 S. 5th Av. 164 Crockett, W. P. Co., 502 S. Canal St. 160 Western Electric Co., 500 S. Clinton St. 162  ELECTRIC SWITCHBOARDS, PANEL
DRUG FIXTURES.	BOARDS. Central Electric Co., 320 S. 5th Av. 164
Brunswicke-Balke-Collender Co., 328 S. Wabash Av.	ELECTRICAL APPARATUS AND SUP-
Plamondon & Tetze Co., 32 S. Clinton. 38	PLIES.
DRY CLEANING—FIREPROOF NAPHTHA STORAGE.  Bowser, S. F. & Co., 343 S. Dearborn St. and Ft. Wayne, Ind.	Beaver Electric Constr. Co., 117 N. Canal St. Benjamin Electric Mfg. Co., 120 S. Sangamon St. Central Electric Co., 320 S. 5th Av. Commonwealth Edison Co., 120 W.
DRY ROOMS.	Adams St. 168 Crockett, W. F. Co., 502 S. Canal St. 160
Am. Laundry Machinery Co., 208 W. Monroe St. Chicago Dryer Co., 630 S. Wabash Av. Kehm Bros. Co., 15 W. Kinzie St. Troy Laundry Machy. Co., 23rd and La Salle Sts.	Freeman-Sweet Co., 538 S. Dearborn St. 158 Kohler Bros., 343 S. Dearborn St. 158 Newgard, Henry & Co., 947 Wash. Bl. Wadeford Electric Co., 140 S. Dearborn 162 Western Electric Co., 500 S. Clinton St. 162 White City Electric Co., 229 W. Van Buren St. 158
DYNAMOS. Beaver Electric Constr. Co., 117 N. Ca-	ELECTRICAL CONSTRUCTION.
nal St. 160 Central Electric Co., 320 S. 5th Av. 164 Commonwealth Edison Co., 120 W. Adams St. 168 Fairbanks, Morse & Co., 900 S. Wabash. 162 Freeman-Sweet Co., 538 S. Dearborn St. 158 Kohler Bros., 343 S. Dearborn St. 158 Newgard, Henry & Co., 947 Wash. Bl. 158 Western Electric Co., 500 S. Clinton St. 162 White City Electric Co., 229 W. Van Buren St. 158	Beaver Electric Constr. Co., 117 N. Canal St. Commonwealth Edison Co., 120 W. Adams St. Crockett. W. P. Co., 502 S. Canal St. Freeman-Sweet Co., 538 S. Dearborn St. Kohler Bros., 343 S. Dearborn St. Newgard, Henry & Co., 947 Wash. Bl. Wadeford Electric Co., 140 S. Dearborn 162 White City Electric Co., 229 W. Van Buren St.
ELECTRIC BELLS AND LIGHTING. Beaver Electric Constr. Co., 117 N. Ca-	ELECTRICAL PUSES.
nal St.  Benjamin Electric Mfg. Co., 120 S.  Sangamon St.  Central Electric Co., 320 S. 5th Av. 164  Commonwealth Edison Co., 120 W.	Central Electric Co., 320 S. 5th Av. 164 Johns-Manville, H. W. Co., 322 N. Michigan Av. 234 Western Electric Co., 500 S. Clinton St. 162 ELECTRICAL HOUSE LIGHTING SUP-
Adams St. 168 Freeman-Sweet Co., 538 S. Dearborn St. 158	PLIES. Central Electric Co., 320 S. 5th Av. 164
Newgard, Henry & Co., 947 Wash, Bl. 158 Wadeford Electric Co., 140 S. Dearborn 162 Western Electric Co., 500 S. Clinton St. 162 White City Electric Co., 229 W. Van Buren St. 158	ELECTRICAL INSULATION.  Central Electric Co., 320 S. 5th Av. 164 Standard Paint Co., The, 122 S. Michigan Av. 228
ELECTRIC CONDUITS AND FITTINGS. Central Electric Co., 320 S. 5th Av. 164	Western Electric Co., 500 S. Clinton St. 162
Western Electric Co., 500 S. Clinton St. 162	ELEVATING AND CONVEYING MACHIN- ERY.
ELECTRIC ELEVATORS.  Altizer Elevator Co., 609 La Salle Av. 26  Kaestner & Hecht Co., 500 S. Throop St. 24  Otis Elevator Co., 600 W. Jackson Bl. 24	Jeffrey Mfg. Co., 343 S. Dearborn St. Joor Engineering Co., Fisher Bldg. 244 Link Belt Co., 39th & Stewart Av. Olson Bros. & Co., 2418 Bloomingdale Av. 244
ELECTRIC FIXTURES.  Benjamin Electric Mfg. Co., 120 S. Sangamon St. Central Electric Co., 320 S. 5th Av. 164 Freeman-Sweet Co., 538 S. Dearborn St. 158 Wadeford Electric Co., 140 S. Dearborn 162	Weller Mfg. Co., 853 E. North Av. 246  ELEVATOR CABLES.  Altizer Elevator Co., 609 La Salle Av. 26  ELEVATOR GATES—AUTOMATIC.
ELECTRIC LIGHT FIXTURES.	Altizer Elevator Co., 609 La Salle Av. 26
Braun, David J. Mfg. Co., The, 668 W. Washington St. 160	Chicago Ornamental Iron Co., 37th &
Beaver Electric Constr. Co., 117 N. Canal St. 1160	Stewart Av. 196 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192
Central Electric Co., 320 S. 5th Av. 164	Heath-Johnson Co., 306 W. Ontario St. 263

	Page	ENGINEERS—CIVIL. P	age
Smith. F. P., W. & I. Wks., 56 W. Lake		Byllesby, H. M. & Co., 175 W. Jackson	
Standard Co., The, 2420 W. 15th St.	2	Blvd.	248
Union Fdry, Wks., 1st Nat'l Bk. Bldg. Vierling Steel Wks., 23rd & Stewart Av.		Cook, Wm. G. Co., 32 N. Clark St. Greeley-Howard Co., 139 N. Clark St.	$\frac{236}{263}$
Winslow Bros. Co., 46th Av. & Harrison		Morey, Newgard & Co., 116 S. Michigan.	250
		Purdy & Henderson, 106 S. Michigan Av.	248
ELEVATOR DOORS-FREIGHT.		Shankland, E. C. & R. M., 209 S. La	
Harris, S. H. Co., 3323 Grand Av.	12	Salle St. Suhr, B. H. & Co., 139 N. Clark St.	$\frac{248}{162}$
ELEVATOR DOORS-PASSENGER			250
Harris, S. H. Co., 3323 Grand Av.	12	Woodman, Andrew W., 122 S. Michi-	
	_	gan Av.	248
FLEVATOR DOORS—FREIGHT AN PASSENGER.	ь	ENGINEERS—CONSULTING.	
Ross, R. J. Mfg. Co., 20th and West-			
ern Av.	198	Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd.	250
DIRTAMOD DIREMDIC CICNATE		Bergendahl-Bass Engineering & Constr.	200
ELEVATOR ELECTRIC SIGNALS. Elevator Sup. & Repair Co., 561 W.		Cook, Wm. G. Co., 32 N. Clark St.	236
Monroe St.	26	Freeman-Sweet Co., 538 S. Dearborn St.	
	- 0	Morey, Newgard & Co., 116 S. Michigan.	250
ELEVATOR FIRE DOORS.		Purdy & Henderson, 106 S. Michigan Av. Shankland, E. C. & R. M., 209 S. La	248
Hanke Iron & Wire Wks., Albany and	16.3	Salle St.	21.
Chicago Aves. Kinnear Mfg. Co., 134 S. La Salle St.	19' 190	Wadeford Electric Co., 140 S. Dearborn	162
Standard Co., The, 2420 W. 15th St.	200	Westcott & Ronneberg, 1049 Otis Bldg.	250
		Woodman, Andrew W., 122 S. Michigan Av.	248
ELEVATOR FLOOR INDICATORS			- 10
Elevator Sup. & Repair Co., 561 W. Monroe St.	26	ENGINEERS—CONTRACTING.	
Standard Co., The, 2420 W. 15th St.	-9	Freeman-Sweet Co., 538 S. Dearborn St.	158
		Kenwood Bridge Co., 1st Nat. Bk. Bldg. Kohler Bros., 343 S. Dearborn St.	155
ELEVATOR MACHINERY.	0.2	Morava Constr. Co., 150 S. Michigan Av.	
Altizer Elevator Co., 609 La Salle Av. Kaestner & Hecht Co., 500 S. Throop St.	26 24	Stewart, James & Co., 343 S. Dearborn St.	
Otis Elevator Co., 600 W. Jackson Bl.		Strobel Steel Constr. Co., Monadnock Wadeford Electric Co., 140 S. Dearborn	198
		Waderold Electric Co., 140 S. Dearborn	100
ELEVATORS—PASSENGER AND FREIGHT.		ENGINEERS—ELECTRICAL.	
Altizer Elevator Co., 609 La Salle Av.	26	Byllesby, H. M. & Co., 175 W. Jackson	
Elevator Sup. & Repair Co., 561 W.		Blvd.	248
Monroe St.	26	ENGINEERS—GAS.	
Kaestner & Hecht Co., 500 S. Throop St. Otis Elevator Co., 600 W. Jackson Bl.		Byllesby, H. M. & Co., 175 W. Jackson	
Otta Elevator Co., 100 W. Jackson Br.	_ 1	Blvd.	248
ELEVATOR REPAIRS.		ENGINEER ITTITATION AND	
Altizer Elevator Co., 609 La Salle Av.	26	DRAINAGE.	
Elevator Sup. & Repair Co., 561 W. Monroe St.	26	Byllesby, H. M. & Co., 175 W. Jackson	
Kaestner & Hecht Co., 500 S. Throop St.		Blvd.	248
Otic Floreton Co. COO W. Joshson Di	0.4	ENGINEERS-MECHANICAL.	
Otis Elevator Co., 600 W. Jackson Bl.	24	Byllesby, H. M. & Co., 175 W. Jackson	
ELEVATOR SAFETY GATES		Blvd.	248
Altizer Elevator Co., 609 La Salle Av.	26	DECIMIEDS DATINAVS	
ENGINES.		ENGINEERS—RAILWAYS.	
Fairbanks, Morse & Co., 900 S. Wabash.	162	Byllesby, H. M. & Co., 175 W. Jackson Blyd.	248
Kaestner & Hecht Co., 500 S. Throop St.			0
ENGINE BEDS.		ENGINEERS—STRUCTURAL.	
Baldwin, M. E., Constr. Co., 140 S. Dear-		Am. Bureau of Inspection and Tests,	250
born St.	266	The, 53 W. Jackson Blvd. Bergendahl-Bass Engineering & Constr.	
Blome, R. S. Co., City Hall Square Bldg.		Co., 111 W. Monroe St.	200
Simpson Constr. Co., Cham. of Com. Bldg. Wilde & Schmidt, 21st, W. of Marshall		Concrete-Steel Products Co., McCor-	176
Blvd.	262	mick Bldg. Corrugated Bar Co., 72 W. Adams St.	4
ENGINES—GAS.		Ewen, John M., Co., The Rookery	46
Fairbanks, Morse & Co., 900 S. Wabash.	162	Morava Constr. Co., 150 S. Michigan Av.	192
		Morey, Newgard & Co., 116 S. Michigan. Purdy & Henderson, 106 S. Michigan Av.	248
ENGINES—HOISTING	1.00	Shankland, E. C. & R. M., 209 S. La	
Fairbanks, Morse & Co., 900 S. Wabash.	162	Salle St.	248
ENGINE—CIL.		Woodman, Andrew W., 122 S. Michi-	248
Fairbanks, Morse & Co., 900 S. Wabash.	162	gan Av.	- 10
ENGINEERS.		ENGINEERS-WATERWORKS.	
Am. Bureau of Inspection and Tests,		Byllesby, H. M. & Co., 175 W. Jackson	
The, 53 W. Jackson Blvd.	250	Blvd.	248
Bergendahl-Bass Engineering & Constr.		EXHAUST PANS.	
Co., 111 W. Monroe St. Hunt, Robt. W. & Co., 209 S. La Salle.	200 250	Central Electric Co., 320 S. 5th Av.	164
Morey, Newgard & Co., 116 S. Michigan		Fairbanks, Morse & Co., 900 S. Wabash.	162
Purdy & Henderson, 106 S. Michigan Av	. 248	Mellish-Hayward Co., 158 W. Kinzie	208
Shankland, E. C. & R. M., 209 S. La Salle St.	245	Ross, R. J. Mfg. Co., 20th and Western Av.	198
Woodman, Andrew W., 122 S. Michi-		Variety Mfg. Co., 2958 Carroll Av.	198
oan Ar	248	Western Electric Co., 500 S. Clinton St.	162

	IN-	FIREPROOF PAINTS.
FORCEMENT. P Northwestern Expanded Metal Co., 37	'age	Ceresit Waterproofing Co., Com. Nat.
W. Van Buren St.	10	Bank Bldg. 28
EXPANSION TANKS		Chicago Ironite Water Proofing Co., 118 N. La Salle St. 28
Kroeschell Bros. Co., 440 W. Erie St.	212	Ill. Damp Proofing Co., 3953 Lowe Av. 30 Moore, Benjamin & Co., 415 N. Green. 228
FEED WATER HEATERS.		Muralo Co., The, 355 River St. 228
Fairbanks, Morse & Co., 900 S. Wabash. Webster, Warren & Co., Monadnock Blk.	162	Western Roofing & Sup. Co., Fisher Bldg. 153
FERRO CEMENT CONSTRUCTION.  Blome, R. S. Co., City Hall Square Bldg.		FIREPROOF PARTITIONS.  Ill. Terra Cotta Lumber Co., Rookery, 180
Simpson Constr. Co., Cham. of Com. Bldg.	186	Nat'l Fire Proofing Co., 72 W. Adams. 180
FIRE APPARATUS.		FIREPROOF SAFES.
Allen, W. D. Mfg. Co., 133 W. Lake St.	26	Harris, S. H. Co., 3323 Grand Av. 12
FIRE BRICK AND CLAY.		FIREPROOF SASH AND FRAMES.
Garden City Sand Co., Cham. of Com.	182	Bremer, H. F., 2229 Ogden Av 62
Jenkins & Reynolds Co., Cham. of Com. McLaughlin Building Material Co., 9 S.	260	Knisely, Harry C., Co., 1908 S. Western Av.
La Salle St.	170	Krefting, E., 622 W. Van Buren St. 62
Wisconsin Lime & Cement Co., Chamber of Commerce 178-	-260	McFarland-Hyde Co., 2701 5th Av. 62 Miller, James A. & Bro., 114 S. Clinton, 62
		Voigtmann & Co., 445 W. Erie St. 60
FIRE DOORS. Hanke Iron & Wire Wks., Albany and		FIREPROOF SHUTTERS AND DOORS.
Chicago Aves.	196	Dodge, H. B. & Co., 332 S. Michigan Av. 190
Harris, S. H. Co., 3323 Grand Av. Ross, R. J. Mfg. Co., 20th and West-	12	Hanke Iron & Wire Wks., Albany and Chicago Aves. 196
ern Av.	198	Kinnear Mfg. Co., 134 S. La Salle St. 190 McFarland-Hyde Co. 2701 5th Av. 62
Smith, F. P., W. & I. Wks., 56 W. Lake Sykes Co., The, 930 W. 19th Pl.	60	McFarland-Hyde Co., 2701 5th Av. 62 Smith, F. P., W. & I. Wks., 56 W. Lake 200
Variety Mfg. Co., 2958 Carroll Av.	198	FIRE PROOF STEEL THEATRE
FIRE DOORS FOR ELEVATORS.		CURTAINS.
Harris, S. H. Co., 3323 Grand Av.	12	Elevator Sup. & Repair Co., 561 W. Monroe St.
FIRE DOORS-UNDERWRITERS		FIREPROOF WINDOWS.
STANDARD.		Bremer, H. F., 2229 Ogden Av. 32
Ross, R. J. Mfg. Co., 20th and Western Av.	198	Concrete-Steel Products Co., McCormick Bldg.
FIRE ESCAPES.		Knisely, Harry C., Co., 1908 S. Western
Cent'l Iron Wks. of Chgo., 939 W. Lake.	194	Av. 60 Krefting, E., 622 W. Van Buren St. 62
Hanke Iron & Wire Wks., Albany and	196	McFarland-Hyde Co., 2701 5th Av. 62
Chicago Aves. Halsted, Joseph. Co., 1233 W. Randolph		Miller, James A. & Bro., 114 S. Clinton, 62 Voigtmann & Co., 445 W. Erie St. 60
III. Architectural Iron Wks., 139 N. Clark St.	194	Winslow Bros. Co., 46th Av. & Harrison 196
Muth, Chr., Mfg. Co., 2218 Blue Island		FIREPROOFING.
Av. Smith, F. P., W. & I. Wks., 56 W. Lake	$\frac{190}{200}$	Ill. Terra Cotta Lumber Co., Rookery. 180 McLaughlin Building Material Co., 9 S.
Union Fdry, Wks., 1st Nat'l Bk. Bldg. Vierling Steel Wks., 23rd & Stewart Av.	192 52	La Salle St. 170
	0.2	Nat'l Fire Proofing Co., 72 W. Adams, 180 Northwestern Expanded Metal Co., 37
Allen, W. D. Mfg. Co., 133 W. Lake St.	26	W. Van Buren St. 10
	-0	FIREPROOFING—SLAG.
FIRE HOSE.	26	Ill. Improvement & Ballast Co., 72 W. Adams St. 188-
Allen, W. D. Mfg. Co., 133 W. Lake St.	-0	FLANGED FITTINGS.
FIRE WINDOWS. Concrete-Steel Products Co., McCor-		Jenkins Bros., 300 W. Lake St. 206
mick Bldg.	176	FLOOR COVERINGS.
Knisely, Harry C., Co., 1908 S. Western Av.	6.0	Carson, Pirie, Scott & Co., Chicago. 232
Miller, James A. & Bro., 114 S. Clinton.	62	FLOORS FOR FACTORIES AND WARE-
FIREPLACE FURNISHINGS, ETC.		HOUSES.
Carson, Pirie, Scott & Co., Chicago.	232	Kissack, Wm. 133 W. Washington St. 1
FIREPROOF DOORS.		FLOORING—COMPOSITION.
Dahlstrom Metallic Door Co., 53 W.	16	Ill. Composition Floor Co., 155 N. Clark. 222 Muller, Franklyn R. & Co., 312 N. May St. 222
Jackson Blvd. McFarland-Hyde Co., 2701 5th Av.	62	FLOORING-FIREPROOF.
Sykes Co., The. 930 W. 19th Pl.	60	Ill. Composition Floor Co., 155 N. Clark. 222
FILEPROOF FLOORS.		Muller, Franklyn R. & Co., 312 N. May St. 222
Concrete-Steel Products Co., McCormick Bldg.	176	FLOORING—HARDWOOD.  North Branch Flooring Co., 3036 N.
Ill. Terra Cotta Lumber Co., Rookery.	180	Western Av. 267
FIREPROOF LOCKERS.		Rittenhouse & Embree Co., 3500 Centre
Durand Steel Locker Co., 76 W. Monroe.	263	Wilce, T. Co., The, 2209 S. Throop St. 36

FLOORING—HOSPITALS, INSTITUTIONS AND PUBLIC PLACES. Page	GAS FITTING.
Ill. Composition Floor Co., 155 N. Clark. 222	Am. Heating & Plumbing Corp., 508 S. Canal St.
Muller, Franklyn R. & Co., 312 N. May St. 222	Lindvall, R. & Co., 1246 W. 59th St. 263
<b>FLOORING—SANITARY.</b> Ill. Composition Floor Co., 155 N. Clark. 222 Muller, Franklyn R. & Co., 312 N. May St. 222	Murphy-Keeley Co., 23 E. Congress St. 268 Nacey, P. Co., 927 S. State St. 156 Nilson Bros., 3222 N. Halsted St. 229 Noble & Thumm, 2313 Lincoln Av. 268
FLOORING-WOOD BLOCK.	Noble & Thumm, 2313 Lincoln Av. 268 Stein, Carl John 853 S. State St. 216
Dodge, H. B. & Co., 332 S. Michigan Av. 190	GAS—ILLUMINATING.
FLUE LININGS.	Peoples Gas Light & Coke Co., Michi-
Garden City Sand Co., Cham. of Com. 182 Hydraulic Press Brick Co., Cham. of	gan Av. and Adams St. 174
Com. Bldg. 260 Lowry, Albert J., Cham. of Com. Bldg. 170	GAS MACHINES.  Johnson Service Co., 177 N. Dearborn. 214
McLaughlin Building Material Co., 9 S. La Salle St. 170	
FORGINGS.	GAS—NATURAL. Peoples Gas Light & Coke Co., Michi-
Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192	gan Av. and Adams St. 174
FOUNDATIONS.	GAS RANGES.
Foundation Co., The Rookery Bldg. 52	Schneider & Trenkamp Co., 315 S. Wabash Av. and Cleveland, Ohio
FOUNDATIONS-CONCRETE.	GAS STOVES.
Foundation Co., The Rookery Bldg. 52 Raymond Concrete Pile Co., 111 W. Monroe St. 182	Schneider & Trenkamp Co., 315 S. Wabash Av. and Cleveland, Ohio 174
Westcott & Ronneberg, 1049 Otis Bldg. 250	GAS WATER HEATER.
FOUNDERS.	Bastian-Morley Co., 64 W. Randolph St. 176
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Ill. Malleable Iron Co., 1801 Diversey Bl. 210	GATE VALVES. Scott Valve Co., 310 W. Randolph St. 206
Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Link Belt Co., 39th & Stewart Av. 244	GENERAL CONTRACTORS.
FRAMES-WINDOW AND DOOR.	Anderson, A. & E. Co., 19 S. La Salle St. 48
Curtis Door & Sash Co., 2355 Blue	Appel, Henry & Son Co., 179 W. Washington St.
Nollan & Wolff Mfg. Co., 1705 Fuller-	Baldwin, M. E., Constr. Co., 140 S. Dearborn St.
ton Av. 34 Paine Lumber Co., Otis Bldg.	Bent, E. M. Co., 189 W. Madison St. 44 Bergendahl-Bass Engineering & Constr.
Inside Back Cover	Co., 111 W. Monroe St. 200 Black, James, Masonry & Contracting
FRICTION CLUTCHES.	Co., 212 W. Washington St 42
Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244	Bulley & Andrews, 25 N. Dearborn St. 267 Cadenhead Co., 9 S. La Salle St. 50
Joor Engineering Co., Fisher Bldg. 244 Kaestner & Hecht Co., 500 S. Throop St. 24	Av. 56
Link Belt Co., 39th & Stewart Av. 241 Olson Bros. & Co., 2418 Bloomingdale	Carson, C. E. Co., 139 N. Clark St. 56 Chaney-Archibald Co., 189 W. Madison. 56
Av. 246 Weller Mfg. Co., 853 E. North Av. 246	Clark, C. Everett Co., 69 W. Washington St. 46
FURNACES.	Cullen, Geo. P., 128 N. La Salle St. 265 Doherty, Frank E., Cham. of Com. Bldg. 267
Lewis & Kitchen, 900 S. Michigan Av 210	Dowling & Rutherford, 54 W. Randolph 267
Mellish-Hayward Co., 158 W. Kinzie. 208 Robinson Furnace Co., 65 W. Lake St. 220	Ewen, John M., Co., The Rookery 46
FURNACES—TUBULAR.	Falkenau Constr. Co., 30 N. La Salle St. 49 Foundation Co., The Rookery Bldg. 52
Robinson Furnace Co., 65 W. Lake St. 220	Fuller, Geo. A. Co., Marquette Bldg. 42 Gilsdorff Bros. Co., 154 W. Randolph St. 266
FURNITURE. Am. Seating Co., 218 S. Wabash Av. 8	Gindele, Chas. W. Co., 3333 La Salle St. 46 Griffiths, John & Son Co., 112 W. Adams
Carson, Pirie, Scott & Co., Chicago. 232	St. Hendry, Alex., 320 W. Indiana St. 266
FURNITURE, SPECIAL DESIGN.	Hinchliff, Geo. Co., 189 W. Madison St. 52 Lanquist & Illsley Co., 1100 N. Clark St. 44
Carson, Pirie, Scott & Co., Chicago. 232 Nelson, W. P., Co., 614 S. Michigan Av. 230	Leonard Constr. Co., 332 S. Michigan Av. 48
Nyden & Thunander, 2960 Michigan Av. 232 Spierling & Linden, 1216 Michigan Av. 239	Martin Constr. Co., 82 W. Washington. 266
Sturdy, Joseph F., 824 S. Michigan Av. 232	Mayor, Wm. Co., 38 S. Dearborn St. 50 McKeown Bros., 4819 Cottage Grove Av. 54
GALVANIZED IRON. Bremer, H. F., 2229 Ogden Av. 62	Meiling & Co., 139 N. Clark St. 265 Menke-Thielberg Co., 139 N. Clark St. 54 Meyne, Gerhardt F., 127 N. Dearborn St. 266
Krefting, E., 622 W. Van Buren St. 62	Meyne, Gerhardt F., 127 N. Dearborn St. 266 Morava Constr. Co., 150 S. Michigan Av. 192
Miller, James A. & Bro., 114 S. Clinton. 62	Morrice & Parron, 17 N. La Salle St. 265 Nicholson. Zimmerman & Co., 133 W.
GARBAGE CREMATORIES.  Kewanee Boiler Co., 27 W. Lake St. 204-205	Washington St. 50 Olson, A. & J., 6 N. Clark St. 266
GAS AND ELECTRIC FIXTURES.	Olson Bros., 6501 Peoria St. 44
Braun, David J. Mfg. Co., The, 668 W. Washington St. 160	Olson & Brockhausen Co., 19 S. La Salle St. 56
Central Electric Co., 320 S. 5th Av. 164	Paschen Bros. 25 N. Dearborn St. 54 Pillinger, W. A. Co., 118 N. La Salle. 54

Page	GRANITE, Page
Regnell, B. J. Co., 189 W. Madison St. 265	Wilde & Schmidt, 21st, W. of Marshall
Rodatz, Jacob, The Rookery, 265	Blvd. 262
Scharmer, Jacob Co., 179 W. Washington 44 Shedden, James & Co., 106 N. La Salle 50	Woodbury Granite Co., 53 W. Jackson
Sollitt, Ralph & Sumner Co., 79 E.	Blvd. 188
Adams St. 52	GRANITE BLOCK.
Snyder, J. W., Peoples Gas Bldg. 42 Stewart, James & Co., 343 S. Dearborn St. 10	McLaughlin Building Material Co., 9 S.
Stewart, James & Co., 343 S. Dearborn St. 10 Strandberg, E. P., Co., 5010 S. Wabash	La Salle St. 170
Av. 265	110
Stressenreuter Bros., Cham. of Com. 265	GRANITE FOR BUILDING PURPOSES.
Thompson-Starrett Co., Fisher Bldg. 42 Todd, James & Co., 9 S. La Salle St. 267	Woodbury Granite Co., 53 W. Jackson
Wells Bros. Co., 53 W. Jackson Blvd. 40	Blvd. 188
GLASS.	GRAVEL.
Am, Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ash-	Am. Sand & Gravel Co., Cham. of Com. Bldg.
land Av. 256	178
	GRILLES.
GLASS-ART, ORNAMENTAL AND	Architectural Dec. Co., 1600 S. Jefferson, 202
STAINED.	Decorators Sup. Co., 2547 Archer Av. 32
Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ash-	Plastic Relief Mfg. Co., 949 N. Halsted 202
land Av. 256	GRILLE WORK-METAL.
Brand, Gustave A. & Co., 1428 Michi-	Chicago Ornamental Iron Co., 37th &
gan Av. Flanagan & Biedenweg Co., 312 W. Illi-	Stewart Av. 192
nois St. 258	Hanke Iron & Wire Wks., Albany and
Giannini & Hilgart, 222 W. Madison St. 258	Chicago Aves. 196 Heath-Johnson Co., 306 W. Ontario St. 263
Nelson, W. P., Co., 614 S. Michigan Av. 230 Nyden & Thunander, 2960 Michigan Av. 232	Smith, F. P., W. & I. Wks., 56 W. Lake 290
Schuler Art Glass Co., 617 Jackson Blvd. 258	Standard Co., The, 2420 W. 15th St. 2
Spierling & Linden, 1216 Michigan Av. 230	Winslow Bros. Co., 46th Av. & Harrison 196
Sturdy, Joseph F., 824 S. Michigan Av. 232	HAIR FELT.
GLASS—BEVELED.	Cent'l Asbestos & Magnesia Co., 25 W.
Am, Luxfer Prism Co., 29 E. Madison. 256	Kinzie St. 263
Am. 3-Way Prism Co., 3633 S. Ash-	Johns-Manville, H. W. Co., 322 N. Michi-
land Av. 256	gan Av. Western Roofing & Sup. Co., Fisher
Flanagan & Biedenweg Co., 312 W. Illinois St.	Bldg. 156
Giannini & Hilgart, 222 W. Madison St. 258	
Schuler Art Glass Co., 617 Jackson Blvd. 258	HAND FUMPS.
Schuler Art Glass Co., 617 Jackson Blvd. 258	<b>HAND FUMPS.</b> Fairbanks, Morse & Co., 900 S. Wabash. 162
Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—CUT.	Fairbanks, Morse & Co., 900 S. Wabash. 162
Schuler Art Glass Co., 617 Jackson Blvd. 258	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.
Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Giannini & Hilgart, 222 W. Madison St. 258	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N.
Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St.	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb. Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W.
Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Giannini & Hilgart, 222 W. Madison St. 258	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois.	Fairbanks, Morse & Co., 900 S. Wabash. 162  HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb. Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 GLASS—METAL LEADED FOR CEILINGS. Flanagan & Biedenweg Co., 312 W. Illinois St.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'. Allerton, Clarke Co., 74 W. Lake St. 263
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CELLINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'. Allerton, Clarke Co., 74 W. Lake St. 263
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. OUT & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 GLASS—METAL LEADED FOR CELLINGS. Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230 GLASS—MOSAIC. Flanagan & Biedenweg Co., 312 W. Illinois St.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  264 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St. 264 Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS. Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC. Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Giannini & Hilgart, 222 W. Madison St. 258	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES. Allerton, Clarke Co., 74 W. Lake St. 263
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. GLASS—CUT.  Flanagan & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. GLASS—MOSAIC.  Flanagan & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 OUT & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. OUT & Lockett Hardware Co., 14 W. Randolph St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. OUT & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 263 Cobb, Whyte & Laemmer Co., 14 W. Randolph St. 263 Clark St. 263 Clark St. 263 Clark St. 263 Clark St. 264 Orr & Lockett Hardware Co., 179 N. Clark St. 264 Orr & Lockett Hardware Co., 179 N. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 264 Cobb, Whyte & Laemmer Co., 179 N. 264 Clark St. 262 Cobb, Whyte & Laemmer Co., 179 N. 264 Clark St. 262
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—WETAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ash-	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264  HARDWOOD FLOORING.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWOOD FLOORING. North Branch Flooring Co., 3036 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Giannini & Hilgart, 222 W. Madison St. Spierling & Linden, 1216 Michigan Av. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264  HARDWOOD FLOCKING.  North Branch Flooring Co., 3036 N. Western Av. 267
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWOOD FLOORING. North Branch Flooring Co., 3036 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Giannini & Hilgart, 222 W. Madison St. Spierling & Linden, 1216 Michigan Av. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 OUT & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264 OUT & Lockett Hardware Co., 14 W. Randolph St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264  HARDWOOD FLOCKING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  Glannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS. Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC. Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. Am. 3-Way Prism Co., 3633 S. Ashland Av.  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 264 Cobb, Whyte & Laemmer Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre Av. Wilce, T. Co., The, 2209 S. Throop St. 36
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256  GRAIN ELEVATOR CONTRACTORS.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWOOD FLOCRING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre Av.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  Glannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS. Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC. Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. Am. 3-Way Prism Co., 3633 S. Ashland Av.  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 264 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTUREERS.  North Branch Flooring Co., 3036 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256  GRAIN ELEVATOR CONTRACTORS.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 14 W. Randolph St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWOOD FLOCKING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTURERS.  North Branch Flooring Co., 3036 N. Western Av.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  Glannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av.  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St.  GRAIN ELEVATOR CONTRACTORS.  Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY.	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTURERS.  North Branch Flooring Co., 3036 N.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256  GRAIN ELEVATOR CONTRACTORS. Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY. Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 264 Cobb, Whyte & Laemmer Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTUREERS.  North Branch Flooring Co., 3036 N. Western Av. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  Glannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St. 256  GRAIN ELEVATOR CONTRACTORS. Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY. Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. Orr & Lockett Hardware Co., 14 W. Randolph St.  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 14 W. Randolph St.  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St.  HARDWOOD FLOCKING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTURERS.  North Branch Flooring Co., 3036 N. Western Av.
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St.  GRAIN ELEVATOR CONTRACTORS.  Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY.  Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. Kaestner & Hecht Co., 500 S. Throop St. 24 Link Belt Co., 39th & Stewart Av. 244	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 36  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTUREERS.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD LUMBER.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St. Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St. Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St.  GRAIN ELEVATOR CONTRACTORS.  Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY.  Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Kaestner & Hecht Co., 500 S. Throop St. 24 Link Belt Co., 39th & Stewart Av. 244 Clson Bros. & Co., 2418 Bloomingdale	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 14 W. Randolph St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  Cobb, Whyte & Laemmer Co., 179 N. Clark St. 263  Cobb, Whyte & Laemmer Co., 179 N. Clark St. 264  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD LUMBER.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD LUMBER.  North Branch Flooring Co., 3036 N. Western Av. Rittenhouse & Embree Co., 3500 Centre
GLASS—CUT.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Giannini & Hilgart, 222 W. Madison St. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258  GLASS—METAL LEADED FOR CEILINGS.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Spierling & Linden, 1216 Michigan Av. 230  GLASS—MOSAIC.  Flanagan & Biedenweg Co., 312 W. Illinois St.  Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Schuler Art Glass Co., 617 Jackson Blvd. 258 Spierling & Linden, 1216 Michigan Av. 230  GLASS—PRISMATIC.  Am. Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ashland Av. 256  GLASS—WIRE.  Mississippi Wire Glass Co., 7 W. Madison St.  GRAIN ELEVATOR CONTRACTORS.  Stewart, James & Co., 343 S. Dearborn St. 40  GRAIN ELEVATOR MACHINERY.  Fairbanks, Morse & Co., 900 S. Wabash. 162 Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. Kaestner & Hecht Co., 500 S. Throop St. 24 Link Belt Co., 39th & Stewart Av. 244	HARDWARE.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 264 Orr & Lockett Hardware Co., 14 W. Randolph St. 30  HARDWARE—BUILDERS'.  Allerton, Clarke Co., 74 W. Lake St. 263 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 30  HARDWARE SPECIALTIES.  Allerton, Clarke Co., 74 W. Lake St. 262 Cobb, Whyte & Laemmer Co., 179 N. Clark St. 36  HARDWOOD FLOORING.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD FLOORING—MANU- FACTUREERS.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36  HARDWOOD LUMBER.  North Branch Flooring Co., 3036 N. Western Av. Wilce, T. Co., The, 2209 S. Throop St. 36

HEAT REGULATION. Page	Page
Johnson Service Co., 177 N. Dearborn, 214 Nat'l Regulator Co., 540 W. Harrison, 214 Powers Regulator Co., 1 S. Wabash Av. 214	Prentice, L. H. Co., 330 Sherman St. 212 Ranney, Charles D. Co., 5139 N. Clark. 216 Reading, W. D. Heating Co., 39 S. La Salle St. 268
HEATERS-WARM AIR AND COMBINA-	Salle St. Schampel & Baldwin, 173 W. Washington St.  268 268
Robinson Furnace Co., 65 W. Lake St. 220	Thomas & Smith, 116 N. Carpenter St. 216
HEATING APPARATUS.	HEAVY FOUNDATIONS. Foundation Co., The Rookery Bldg. 52
Am. Heating & Plumbing Corp., 508 S.	HECTOGRAPH PRINTS.
Bastian-Morley Co., 64 W. Randolph St. 176	Am. Blue Print Paper Co., 335 Plymouth Ct. 264
Dilzer, Fred, 166 N. Dearborn St. 218 Ehrlich & Co., 136 W. Lake St. 218	Crofoot. Nielsen & Co., 180 W. Washington St.
General Fire Extinguisher Co., 108 S. La Salle St.	HOISTS—STFAM, ELECTRIC AND GAS-
Graves, W. B. Co., 211 N. Jefferson, 210 Hanrahan, Wm., 807 W. 35th St. 268	OLINE. Fairbanks, Morse & Co., 900 S. Wabash. 162
III. Malleable Iron Co., 1801 Diversey Bl. 210	HOISTING AND CONVEYING MACHIN-
Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kilander, A. & Co., 126 S. Clinton St. 268	ERY. Fairbanks, Morse & Co., 900 S. Wabash. 162
Kroeschell Bros. Co., 440 W. Erie St. 212	Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244
Lewis & Kitchen, 900 S. Michigan Av. 210 Mellish-Hayward Co., 158 W. Kinzie 208	Link Belt Co., 39th & Stewart Av. 244
Nacey, P. Co., 927 S. State St. 156 Narowetz Heating & Ventilating Co.,	Olson Bros. & Co., 2418 Bloomingdale Av. 246 Welley Mag Co. 572 F. North Av. 246
223 W. Lake St. 208 Nilson Bros., 2222 N. Halsted St. 220	Weller Mfg. Co., 853 E. North Av. 246 HOISTING ROPES.
Phillips-Getschow Co., 130 W. Kinzie. 212 Pope, Wm. A., 26 N. Jefferson St. 263	Macomber & Whyte Rope Co., 507 S.
Prentice, L. H. Co., 330 Sherman St. 212 Ranney, Charles D. Co., 5139 N. Clark. 216	Clinton St. 267
Reading, W. D. Heating Co., 39 S. La Salle St. 268	HOLLOW STEEL DOORS.  Dahlstrom Metallic Door Co., 53 W.
Schampel & Baldwin, 173 W. Washington St. 268	Jackson Blvd. 16 Sykes Co., The, 930 W. 19th Pl. 60
Thomas & Smith, 116 N. Carpenter St. 216	HORIZONTAL FOLDING DOORS.
HEATING SUPPLIES.	Harris, S. H. Co., 3323 Grand Av. 12
Am. Heating & Plumbing Corp., 508 S. Canal St. 220	HOSE, RACKS AND REELS.
Canal St. 220	Allon W. L. Nifer Co. 199 W. Loke Ct. 90
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216	Allen, W. D. Mfg. Co., 133 W. Lake St. 26
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. 208	HCT BLAST HEATING APPARATUS. Am. Heating & Plumbing Corp., 508 S.
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 110. Malleable Iron Co., 1801 Diversey Bl. 210 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. 220  Arcade Steam Heating Co., 118 W. Kin-
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 156	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St.  Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Mil-
Davis, G. M. Regulator Co., 422 Mil-waukee Av. 11. Malleable Iron Co., 1801 Diversey Bl. 210 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6511 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey. P. Co., 927 S. State St. 156 Fbillins-Getschow Co., 130 W. Kinzie, 212	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kehm Bros. Co., 15 W. Kinzie St. 208
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 156	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kehm Bros. Co., 15 W. Kinzie St. Kilander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Wash-
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 210 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey. P. Co., 927 S. State St. 212 Prentice, L. H. Co., 330 Sherman St. 212 Prentice, L. H. Co., Monadnock Blk. 214  HEATING—VACUUM.	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kin Bros. Co., 15 W. Kinzie St. Kilander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie 208
Davis, G. M. Regulator Co., 422 Milwaukee Av. 11. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacev. P. Co., 927 S. State St. 212 Phillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 330 Sherman St. 212 Webster, Warren & Co., Monadnock Blk. 214	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kehm Bros. Co., 15 W. Kinzie St. Kilander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie Nacey. P. Co., 927 S. State St. Narowetz Heating & Ventilating Co.
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 210 Kehm Bros, Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros, Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 212 Prentice, L. H. Co., 330 Sherman St. 212 Prentice, L. H. Co., 330 Sherman St. 212 Webster, Warren & Co., Monadnock Blk. 214  HEATING—VACUUM. Hanrahan, Wm., 807 W. 35th St. 268 Webster, Warren & Co., Monadnock Blk. 214	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kihander, A. & Co., 126 S. Clinton St. Kilander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie Nacey, P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 223 W. Lake St. Fhillips-Getschow Co., 130 W. Kinzie.
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacev. P. Co., 927 S. State St. 156 Phillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 330 Sherman St. 212 Webster, Warren & Co., Monadnock Blk. 214  HEATING—VACUUM. Hanrahan, Wm., 807 W. 35th St. 268 Webster, Warren & Co., Monadnock Blk. 214  HEATING AND VENTILATING. Am. Heating & Plumbing Corp., 508 S. Canal St. 220	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kihm Bros. Co., 15 W. Kinzie St. Kilander. A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie Nacey. P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 223 W. Lake St. Fhillips-Getschow Co., 130 W. Kinzie. Prentice, L. H. Co., 330 Sherman St.
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros, Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros, Co., 440 W. Erie St. 212 Kroeschell Bros, Co., 440 W. Erie St. 212 Kroeschell Bros, State St. 156 Fhillips-Getschow Co., 130 W. Kinzie, 212 Prentice, L. H. Co., 330 Sherman St. 212 Webster, Warren & Co., Monadnock Blk, 214  HEATING—VACUUM.  Hanrahan, Wm., 807 W. 35th St. 268 Webster, Warren & Co., Monadnock Blk, 214  HEATING AND VENTILATING. Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. 268	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kehm Bros. Co., 15 W. Kinzie St. Wehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie 208 Nacey. P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 223 W. Lake St. Phillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 330 Sherman St.  HOT WATER HEATERS. Arcade Steam Heating Co., 118 W. Kin-
Davis, G. M. Regulator Co., 422 Milwaukee Av.  11l. Malleable Iron Co., 1801 Diversey Bl. 210 Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey. P. Co., 927 S. State St. 212 Prentice, L. H. Co., 330 Sherman St. 212 Prentice, L. H. Co., 330 Sherman St. 212 Webster, Warren & Co., Monadnock Blk. 214  HEATING—VACUUM. Hanrahan, Wm., 807 W. 35th St. 268 Webster, Warren & Co., Monadnock Blk. 214  HEATING AND VENTILATING. Am. Heating & Plumbing Corp., 508 S. Canal St. 4 Arcade Steam Heating Co., 118 W. Kinzie St. 268 Dilzer, Fred, 166 N. Dearborn St. 218 Ehrlich & Co., 136 W. Lake St. 218	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kihander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie 208 Nacey, P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 223 W. Lake St. Phillips-Getschow Co., 130 W. Kinzie. Prentice, L. H. Co., 330 Sherman St.  HOT WATER HEATERS.  Arcade Steam Heating Co., 118 W. Kinzie 218 Dilzer, Fred, 166 N. Dearborn St.  220 221 226 227 228 228 229 240 250 268 268 268 268 268 268 268 268 268 268
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Davis, G. M. Regulator Co., 422 Milwaukee Av.  Ill. Malleable Iron Co., 1801 Diversey Bl. 219 Kehm Bros. Co., 15 W. Kinzie St. Kewanee Boiler Co., 27 W. Lake St. 204-205 Kirk. Geo. H., 6711 Wentworth Av. Kroeschell Bros. Co., 440 W. Erie St. 212 Prentice, L. H. Co., 320 Sherman St. 212 Webster, Warren & Co., Monadnock Blk. 214  HEATING—VACUUM.  Hanrahan, Wm., 807 W. 35th St. Webster, Warren & Co., Monadnock Blk. 214  HEATING AND VENTILATING.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Dilzer, Fred, 166 N. Dearborn St. 218 Ehrlich & Co., 128 W. Lake St. General Fire Extinguisher Co., 108 S. La Salle St. Graves, W. B. Co., 211 N. Jefferson. 210 Hanrahan, Wm., 807 W. 35th St., 170 yellow Engineering Co., 343 S. Dearborn St. Kirk. Geo., H., 6711 Wentworth Av. Kroeschell Bros. Co., 440 W. Erie St. Lewis & Kitchen, 900 S. Michigan Av. Lindvall, R. & Co., 1246 W. 59th St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie Nacey. P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 208	HCT BLAST HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Arcade Steam Heating Co., 118 W. Kinzie St. Davis, G. M. Regulator Co., 422 Milwaukee Av. Kehm Bros. Co., 15 W. Kinzie St. Silander, A. & Co., 126 S. Clinton St. Mehring & Hanson Co., 307 W. Washington Mellish-Hayward Co., 158 W. Kinzie 208 Nacey. P. Co., 927 S. State St. Narowetz Heating & Ventilating Co., 223 W. Lake St. Phillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 330 Sherman St.  HOT WATER HEATERS.  Arcade Steam Heating Co., 118 W. Kinzie St. Dilzer, Fred, 166 N. Dearborn St. Hanrahan, Wm., 807 W. 35th St. Hanrahan, Wm., 807 W. 35th St. Kewanee Boiler Co., 27 W. Lake St. 204-205 Kilander, A. & Co., 126 S. Clinton St. Kroeschell Bros. Co., 440 W. Erie St. Lewis & Kitchen, 900 S. Michigan Av. Mott, J. L., Iron Wks., 104 S. Michigan. Nacey. P. Co., 927 S. State St. Fhillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 320 Sherman St. 156 Fhillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 320 Sherman St. 212 Reading, W. D. Heating Co., 39 S. La Salle St. Thomas & Smith, 116 N. Carpenter St. 216  HOT WATER AND STEAM HEATING.

Demo	
Dilzer, Fred, 166 N. Dearborn St.  Page 218	INSULATING PAPERS. Page
Ehrlich & Co., 136 W. Lake St. 218	Johns-Manville, H. W. Co., 322 N. Michi-
General Fire Extinguisher Co., 108 S.	gan Av. 234 Standard Paint Co., The, 122 S. Michi-
La Salle St. Craves, W. B. Co., 211 N. Jefferson. 210	gan Av. 228
Hanrahan, Wm., 807 W. 35th St., 268	Union Fibre Co., Great Northern Bldg. 234
Kehm Bros. Co., 15 W. Kinzie St. 208 Kilander A & Co., 126 S. Clinton St. 268	Western Roofing & Sup. Co., Fisher Bldg. 156
Kilander, A. & Co., 126 S. Clinton St. 268 Kirk, Geo. H., 6711 Wentworth Av. 218	INSURANCE.
Kroeschell Bros. Co., 440 W. Erie St. 212	U. S. Fidelity & Guaranty Co., 134 S.
Lewis & Kitchen, 900 S. Michigan Av. 210	La Salle St. 64
Mehring & Hanson Co., 307 W. Washington 212	INSURANCE (IN ALL ITS BRANCHES).
Nacey, P. Co., 927 S. State St. 156	U. S. Fidelity & Guaranty Co., 134 S.
Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	La Salle St. 64
Nilson Bros., 3222 N. Halsted St. 220	INTERIOR DECORATORS.
Noble & Thumm, 2313 Lincoln Av. 268	Brand, Gustave A. & Co., 1428 Michi-
Phillips-Getschow Co., 130 W. Kinzie. 212 Pope, Wm. A., 26 N. Jefferson St. 268	gan Av. 230
Prentice, L. H. Co., 330 Sherman St. 212	Carson. Pirie, Scott & Co., Chicago. 232
Ranney, Charles D. Co., 5139 N. Clark. 215	Eckart, J. F. Co., 105 S. Dearborn St. 262 Gleich, T. C., 2860 Evanston Av. 232
Reading, W. D. Heating Co., 39 S. La Salle St.	McCarthy, E. J. Co., 180 N. Dearborn 262
Schampel & Baldwin, 173 W. Washing-	Nelson, W. P., Co., 614 S. Michigan Av. 230
ton St. 268 Thomas & Smith 116 N. Carpenter St. 216	Noelle, J. B. Co., 179 W. Washington, 242 Nyden & Thunander, 2960 Michigan Av. 232
Thomas & Smith: [19 N. Carpenter St. 216	Scheuren, Jos. M., 5 N. Wabash Av. 250
HOUSE FURNISHERS, DESIGNERS AND	Spierling & Linden, 1216 Michigan Av. 230 Sturdy, Joseph F., 824 S. Michigan Av. 232
DECORATORS.	Sturdy, Joseph F., 824 S. Michigan Av. 232
Carson. Pirie, Scott & Co., Chicago. 232	INTERIOR FINISH.
HOUSE MOVERS AND RAISERS.	Baumann, F. O. Mfg. Co., 1501 Smith Av. 38
Brown, Wm. H. & Co., 5643 S. Halsted. 58	Mears-Slayton Lumber Co., 1237 Bel- mont Av. 38
Friestedt, L. P. Co., Tribune Bldg. 55 Sheeler & Son Co., Cham. of Com. Bldg. 55	Nollau & Wolff Mfg. Co., 1705 Fuller-
	ton Av. 34 Plamondon & Tetze Co., 32 S. Clinton. 38
HUMIDITY CONTROL.	
Iroquois Engineering Co., 343 S. Dearborn St.	INTERIOR MOLDINGS.
Thomas & Smith, 116 N. Carpenter St. 216	Nollau & Wolff Mfg. Co., 1705 Fuller- ton Av. 34
HYDRANTS.	INTERLOCKING RUBBER TILE.
Jenkins Bros., 300 W. Lake St. 206	N. Y. Belting & Packing Co., 130 W.
Scott Valve Co., 310 W. Randolph St. 206	Lake St. 26
HYDRANTS—FIRE.	
Chapman Valve Co., 14 N. Franklin St. 208	IRON DOORS AND SHUTTERS.
	Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake, 194
HYDRAULIC ELEVATORS.	Dahlstrom Metallic Door Co., 53 W. Jackson Blvd.
Altizer Elevator Co., 609 La Salle Av. 26 Otis Elevator Co., 600 W. Jackson Bl. 24	Jackson Blyd. 16
Otis Elevator Co., 600 W. Jackson Bl. 14	Hanke Iron & Wire Wks., Albany and Chicago Aves. 196
ICE FACTORY AND REFRIGERATING	Halsted, Joseph, Co., 1233 W. Randolph 192
PLANT SUPPLIES.	Harris, S. H. Co., 3323 Grand Av. 12 Ill. Architectural Iron Wks., 139 N.
Wolf, Fred W. Co., 827 Rees St. Inside front cover	Clark St. 194
	Kinnear Mfg. Co., 134 S. La Salle St. 199 Muth, Chr., Mfg. Co., 2218 Blue Island
Wolf, Fred W. Co., \$27 Rees St.	Av. 139
Inside front cover	Ross, R. J. Mfg. Co., 20th and West-
	Smith, F. P., W. & I. Wks., 56 W. Lake 200
ICE MAKING AND REFRIGERATING MACHINERY.	Vierling Steel Wks., 23rd & Stewart Av. 52
Wolf, Fred W. Co., 827 Rees St.	
Inside front cover	IRON FOUNDRIES.
INDIRECT LIGHTING APPLIANCES.	Butler St. Fdry. & Iron Co., 3422 Butler, 198 Reder Fdry Co., 2125 Canalport Av. 266
Nat'l X-Ray Reflector Co., 235 Jackson Blvd. 30	IRON RAILINGS AND FENCES.
	Butler St. Fdry. & Iron Co., 3422 Butler. 198
INDUCED DRAFT REGULATORS.	Chicago Ornamental Iron Co., 37th &
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216	Stewart Av. 196 Hanke Iron & Wire Wks., Albany and
	Chicago Aves 196
INSPECTORS.	Halsted, Joseph, Co., 1233 W. Randolph 192
Am. Bureau of Inspection and Tests, The, 53 W. Jackson Blvd. 250	Holmes, Pyott & Co., 159 N. Jefferson, 194 Muth, Chr., Mfg. Co., 2218 Blue Island
Hunt. Robt. W. & Co., 209 S. La Salle. 250	Av. 190
INCHLATION DEPUTERTED AND CO.	South Halsted St. Iron Wks., 1st Nat'l Bank Bldg.
INSULATION—BREWERIES AND COLD STORAGE WAREHOUSES.	Smith. F. P., W. & I. Wks., 56 W. Lake 200
Ill. Terra Cotta Lumber Co., Rookery, 189	Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg, 192
Nat'l Fire Proofing Co., 72 W. Adams. 180	Vierling Steel Wks., 23rd & Stewart Av. 52
Union Fibre Co., Great Northern Bldg. 234	Winslow Bros. Co., 46th Av. & Harrison 196

IRON ROOFS. Page	TARDS DUMEDIOD IDON AND DROWER
Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192	LAMPS, EXTERIOR—IRON AND BRONZE. Page
Muth, Chr., Mfg. Co., 2218 Blue Island	Braun, David J. Mfg. Co., The, 668 W.
Av. 190	Washington St. 160 Chicago Ornamental Iron Co., 37th &
Strobel Steel Constr. Co., Monadnock 198	Stewart Av. 196
IRON STAIRS.	Standard Co., The, 2420 W. 15th St. 2 Winslow Bros. Co., 46th Av. & Harrison 196
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194	
Chicago Ornamental Iron Co., 37th &	LAMPS—ORNAMENTAL, ART GLASS, ETC.
Stewart Av. 136 Division Iron Wks., 1317 W. Division St. 266	Carson. Pirie, Scott & Co., Chicago. 232
Hanke Iron & Wire Wks., Albany and	
Chicago Aves. 196	LANDSCAPE ENGINEERS Wittbeld. Geo. Co., The, 737 Bucking-
Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263	ham Pl. 267
Heath-Johnson Co., 306 W. Ontario St. 263 Ill. Architectural Iron Wks., 139 N.	LANTERNS.
Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island	Braun, David J. Mfg. Co., The, 668 W.
Av. 199	Washington St. 160
Smith, F. P., W & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2	LATH-METAL AND WIRE.
Vierling Steel Wks., 23rd & Stewart Av. 52	Northwestern Expanded Metal Co., 37
Winslow Bros. Co., 46th Av. & Harrison 196	W. Van Buren St. 10 Voss, Frederick, 1852 Austin Av. 242
IRON STORE FRONTS.	Voss, Frederick, 1852 Austin Av. 242 Wisconsin Lime & Cement Co., Cham-
Butler St. Fdry. & Iron Co., 3422 Butler, 198	ber of Commerce 178-260
Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th &	LAUNDRY DRYERS.
Stewart Av. 196	Am. Laundry Machinery Co., 208 W.
Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and	Monroe St. 236 Chicago Dryer Co., 630 S. Wabash Av. 236
Chicago Aves. 196	Troy Laundry Machy. Co., 23rd and
Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263	La Salle Sts. 236
III. Architectural Iron Wks., 139 N.	LAUNDRY MACHINERY.
Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island	Am. Laundry Machinery Co., 208 W. Monroe St. 236
Av. 199	Chicago Dryer Co., 630 S. Wabash Av. 236
Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2	Troy Laundry Machy. Co., 23rd and
Vierling Steel Wks., 23rd & Stewart Av. 52	La Salle Sts. 236
Western Iron Co., 1809 Belmont Av. 264 Winslow Bros. Co., 46th Av. & Harrison 196	LAUNDRY MACHINERY SUPPLIES.
	Am. Laundry Machinery Co., 208 W. Monroe St. 236
IRON WORK-ORNAMENTAL.	
	Troy Laundry Machy, Co., 23rd and
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake, 194	
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake, 194 Chicago Ornamental Iron Co., 37th &	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake, 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks, of Chgo., 939 W. Lake, 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 396 W. Ontario St. 263	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks, of Chgo., 939 W. Lake, 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING. Mellish-Hayward Co., 158 W. Kinzie . 208
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Bivision Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 396 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING. Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N.	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING.  Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S.
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING. Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St.  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W.
Butler St. Fdry. & Iron Co., 3422 Butler. 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk, Bldg, 192	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St.  LIGHTING FIXTURES.  Braun, David J. Mfg. Co., The, 668 W. Washington St. Central Electric Co., 320 S. 5th Av. 164
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry, & Iron Co., 3422 Butler, 198	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fåry. Wks., 1st Nat'l Bk. Eldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196 IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle. 184
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Kenwood Bridge Co., 15t Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192 Smith F. P. W. & I. Wks., 50	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fåry. Wks., 1st Nat'l Bk. Eldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196 IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock Western Iron Co., 1809 Belmont Av. 264	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle. 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING. Jeffrey Mfg. Co., 343 S. Dearborn St. 244
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry, & Iron Co., 3422 Butler. 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock 198 Western Iron Co., 1809 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry, & Iron Co., 3422 Butler. 198	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St.  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St.  La Salle St.  Meacham & Wright Co., 134 S. La Salle. 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry, & Iron Co., 3422 Butler. 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock 198 Western Iron Co., 1809 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry, & Iron Co., 3422 Butler. 198	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES. Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244 Link Belt Co., 39th & Stewart Av. 244
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Standard Co., The, 2420 W. 15th St. 2 Union Fåry, Wks., 1st Nat'l Bk. Eldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196 IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., 1508 S. Michigan Av. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock Western Iron Co., 1509 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Halsted, Joseph. Co., 1233 W. Randolph 192 Holmes, Pyott & Co., 1239 W. Randolph 192	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. Muth. Chr Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. Smith. F. P. W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry. Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Morava Constr. Co., 150 S. Michigan Av. 192 Smith. F. P. W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock Western Iron Co., 1809 Belmont Av.  7AIL AND PRISON BUILDERS. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Halsted, Joseph. Co., 1233 W. Randolph 192 Holmes. Pyott & Co., 159 N. Jefferson. 194 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg.	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170  Meacham & Wright Co., 134 S. La Salle. 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., F!sher Bldg. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.  Corn Exch. Nat'l Bank, 134 S. La Salle. 22 Greenebaum Sons Bank & Trust Co.,
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. Muth. Chr Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. Smith. F. P. W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry. Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Morava Constr. Co., 150 S. Michigan Av. 192 Smith. F. P. W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock Western Iron Co., 1809 Belmont Av.  7AIL AND PRISON BUILDERS. Butler St. Fdry. & Iron Co., 3422 Butler. 198 Halsted, Joseph. Co., 1233 W. Randolph 192 Holmes. Pyott & Co., 159 N. Jefferson. 194 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg.	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry, & Iron Co., 3422 Butler, 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Smith, F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock Western Iron Co., 1809 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry, & Iron Co., 3422 Butler, 198 Halsted, Joseph, Co., 1233 W. Randolph 192 Holmes, Pyott & Co., 159 N. Jefferson, 194 South Halsted St. Iron Wks., 1st Nat'l	Troy Laundry Machy. Co., 23rd and La Salle Sts.  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle. 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.  Corn Exch. Nat'l Bank, 134 S. La Salle. 22 Greenebaum Sons Bank & Trust Co., 1255 N. Clark St. 220
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph. Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth. Chr Mfg. Co., 2218 Blue Island Av. 190 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry. Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196 IRON WORK—STRUCTURAL. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Morava Constr. Co., 150 S. Michigan Av. 192 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock 198 Western Iron Co., 1809 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Halsted, Joseph. Co., 1233 W. Randolph 192 Holmes. Pyott & Co., 159 N. Jefferson. 194 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 192 Smith. F. P. W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock 198 Western Iron Co., 1809 Belmont Av. 264  7AIL AND PRISON BUILDERS. Butler St. Fdry. & Iron Co., 3422 Butler, 198 Halsted, Joseph. Co., 1233 W. Randolph 192 Holmes. Pyott & Co., 159 N. Jefferson. 194 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg. 192 Wierling Steel Wks., 23rd & Stewart Av. 52  KALSOMINE.	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES. Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.  Corn Exch. Nat'l Bank, 134 S. La Salle. 22 Greenebaum Sons Bank & Trust Co.,
Butler St. Fdry, & Iron Co., 3422 Butler, 198 Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Chicago Ornamental Iron Co., 37th & Stewart Av. 196 Division Iron Wks., 1317 W. Division St. 266 Hanke Iron & Wire Wks., Albany and Chicago Aves. 196 Halsted, Joseph, Co., 1233 W. Randolph 192 Heath-Johnson Co., 306 W. Ontario St. 263 Holmes. Pyott & Co., 159 N. Jefferson. 194 Ill. Architectural Iron Wks., 139 N. Clark St. 194 Muth, Chr., Mfg. Co., 2218 Blue Island Av. South Halsted St. Iron Wks., 1st Nat'l Bank Bidg. 194 Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Winslow Bros. Co., 46th Av. & Harrison 196  IRON WORK—STRUCTURAL. Butler St. Fdry, & Iron Co., 3422 Butler. 198 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192 Smith. F. P. W. & I. Wks., 56 W. Lake 200 Strobel Steel Constr. Co., Monadnock 198 Western Iron Co., 1809 Belmont Av. 264  TAIL AND PRISON BUILDERS. Butler St. Fdry, & Iron Co., 3422 Butler. 198 Halsted, Joseph, Co., 1233 W. Randolph 192 Holmes. Pyott & Co., 159 N. Jefferson. 194 South Halsted St. Iron Wks., 156 W. Lake 200 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52 Vierling Steel Wks., 1st Nat'l Bank Bldg. 192 Vierling Steel Wks., 1st Nat'l Bk. Bldg. 192 Vierling Steel Wks., 23rd & Stewart Av. 52	Troy Laundry Machy. Co., 23rd and La Salle Sts. 236  LAUNDRY TRAYS AND KITCHEN Alberene Stone Co., 214 N. Clinton St. 262  LEAD BURNING.  Mellish-Hayward Co., 158 W. Kinzie . 208  LEATHER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St. 26  LIABILITY INSURANCE. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64  LIGHTING FIXTURES.  Braun. David J. Mfg. Co., The, 668 W. Washington St. 160 Central Electric Co., 320 S. 5th Av. 164  LIME.  McLaughlin Building Material Co., 9 S. La Salle St. 170 Meacham & Wright Co., 134 S. La Salle. 184 Wisconsin Lime & Cement Co., Chamber of Commerce 178-260  LINK BELTING.  Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Joor Engineering Co., Fisher Bldg. 244 Link Belt Co., 39th & Stewart Av. 244  LOANS.  Corn Exch. Nat'l Bank, 134 S. La Salle. 22 Greenehaum Sons Bank & Trust Co., 125 N. Clark St. 220

LUMBER. Page	Page
Mears-Slayton Lumber Co., 1237 Bel-	Leonard Constr. Co., 332 S. Michigan Av. 48 Lund. Abraham Co., 610 Security Bldg, 48
mont Av. 38	Martin Constr. Co., 82 W. Washington, 266
Paine Lumber Co., Otis Bldg. Inside Back Cover	Mayor, Wm. Co., 38 S. Dearborn St. 50 Meiling & Co., 139 N. Clark St. 265
Rittenhouse & Embree Co., 3500 Centre	Menke-Thielberg Co., 139 N. Clark St. 54
Av. Wilce, T. Co., The, 2209 S. Throop St. 36	Menke-Thielberg Co., 139 N. Clark St. 54 Meyne, Gerhardt F., 127 N. Dearborn St. 266
Yellow Pine Mfrs. Assn., Wright Blog.,	Morrice & Barron, 17 N. La Salle St. 265 Nicholson, Zimmerman & Co., 133 W.
St. Louis, Mo. 36	Washington St. 50
LUMBER-KILN DRIED.	Olson, A. & J., 6 N. Clark St. 266 Olson Bros., 6501 Peoria St. 44
Rittenhouse & Embree Co., 3500 Centre	Olson & Brockhausen Co., 19 S. La
Av. 34	Salle St. 56 Paschen Bros., 25 N. Dearborn St. 54
Wilce, T. Co., The, 2209 S. Throop St. 36	Pillinger, W. A. Co., 118 N. La Salle. 54
LUMBER-YELLOW PINE-LONG LEAF.	Regnell, B. J. Co., 189 W. Madison St. 265 Rodatz, Jacob, The Rookery. 265
Yellow Fine Mfrs. Assn., Wright Bldg.,	Scharmer, Jacob Co., 179 W. Washington 44
St. Louis, Mo. 36	Shedden, James & Co., 106 N. La Salle 50 Sollitt, Ralph & Sumner Co., 79 E.
	Adams St. 52 Snyder, J. W., Peoples Gas Bldg. 42
MACADAM—SLAG.	Stewart, James & Co., 343 S. Dearborn St. 40
Ill. Improvement & Ballast Co., 72 W. Adams St. 188	Strandberg, E. P., Co., 5010 S. Wabash
	Av. 265 Stressenreuter Bros., Cham. of Com. 265
MACHINISTS.	Thompson-Starrett Co., Fisher Bldg. 42
Jeffrey Mfg. Co., 343 S. Dearborn St. 244 Kaestner & Hecht Co., 500 S. Throop St. 24	Todd, James & Co., 9 S. La Salle St. 267 Wells Bros. Co., 53 W. Jackson Blvd. 40
Link Belt Co., 39th & Stewart Av. 244	METAL CEILINGS.
Olson Bros. & Co., 2418 Bloomingdale Av. 246	Bremer, H. F., 2229 Ogden Av. 62
Schultz, Walter L., 29 S. Clinton St. 196	Krefting, E., 622 W. Van Buren St. 62
Weller Mfg. Co., 853 E. North Av. 246 Wolf, Fred W. Co., 827 Rees St.	Miller, James A. & Bro., 114 S. Clinton. 62
Inside front cover	METAL LATH.
MAGNESIA PRODUCTS.	Northwestern Expanded Metal Co., 37 W. Van Buren St. 10
Cent'l Asbestos & Magnesia Co., 25 W.	Voss, Frederick, 1852 Austin Av. 242
Kinzie St. 263	METAL SASH AND FRAMES.
MARBLE CONTRACTORS.	Bremer, H. F., 2229 Ogden Av. 62
Art Marble Co., 2608 Flournoy St. 238	Concrete-Steel Products Co., McCor- mick Bldg. 176
Marthens, Chester N. Marble Co., 53rd	Krefting, E., 622 W. Van Buren St. 62
and Wallace Sts. 238 Taylor-King Marble Co., 608-618 E. 40th	Miller, James A. & Bro., 114 S. Clinton. 62 Sykes Co., The, 930 W. 19th Pl. 60
St. 238	Voigtmann & Co., 445 W. Erie St. 60
MARBLE WORKERS AND DEALERS.	METAL WEATHER STRIPS.
Art Marble Co., 2608 Flournoy St. 238	Chicago Metal Weather Strip Co., 1617
Marthens, Chester N. Marble Co., 53rd	N. Troy St. 164 Robbins Mfg. Co., Monadnock Blk. 164
and Wallace Sts. 238 Taylor-King Marble Co., 608-618 E. 40th	
St. 238	METALLIC DOORS.  Dahlstrom Metallic Door Co., 53 W.
MASON CONTRACTORS.	Jackson Blvd. 16
Anderson, A. & E. Co., 19 S. La Salle St. 48	McFarland-Hyde Co., 2701 5th Av. 62 Sykes Co., The, 930 W. 19th Pl. 60
Appel, Henry & Son Co., 179 W. Wash-	by Meb (oi, The, too in total In
ington St. Baldwin, M. E., Constr. Co., 140 S. Dear-	MILL CONSTRUCTED BUILDINGS. Chaney-Archibald Co., 189 W. Madison. 56
born St. 266	
Bent, E. M. Co., 189 W. Madison St. 44 Black, James, Masonry & Contracting	MILL WORK. Curtis Door & Sash Co., 2355 Blue
Co., 212 W. Washington St. 42 Bulley & Andrews, 25 N. Dearborn St. 267	Island Av. 10
Cadenhead Co., 9 S. La Salle St. 50	Mears-Slayton Lumber Co., 1237 Bel-
Carden-Callahan Co., 332 S. Michigan Av. 56	mont Av.  Morgan Sash & Door Co., Blue Island
Av. 56 Carson, C. E. Co., 139 N. Clark St. 56 Chaney-Archibald Co., 189 W. Madison. 56	Av. and Wood St. Inside Back Cover Nollau & Wolff Mfg. Co., 1705 Fuller-
Chaney-Archibald Co., 189 W. Madison. 56 Clark, C. Everett Co., 69 W. Washing-	ton Av. 34
ton St. 46	Paine Lumber Co., Otis Bldg. Inside Back Cover
Cullen, Geo. P., 128 N. La Salle St. 265 Doherty, Frank E., Cham. of Com. Bldg. 267	
Dowling & Rutherford, 54 W. Randolph 267	MINERAL WOOL. Cent'l Asbestos & Magnesia Co., 25 W.
Ericsson, Henry Co., 139 N. Clark St. 156 Ewen, John M., Co., The Rookery 46	Kinzie St. 263
Fuller, Geo. A. Co., Marquette Bldg. 42	Union Fibre Co., Great Northern Bldg. 234 Watson, H. F. Co., 319 Wells St. 234
Gilsdorff Bros. Co., 154 W. Randolph St. 266 Gindele, Chas. W. Co., 3333 La Salle St. 46	Western Roofing & Sup. Co., Fisher
Griffiths, John & Son Co., 112 W. Adams	Bldg. 156
St. 40 Hendry, Alex., 320 W. Indiana St. 266	MORTGAGE LOANS.
Hinchliff, Geo. Co., 189 W. Madison St. 52	Greenebaum Sons Bank & Trust Co.,
Lanquist & Illsley Co., 1100 N. Clark St. 44	155 N. Clark St. 220

MORTAR COLORS.		PAINT—CEMENT.	
Bonner & Marshall Co., Cham. of Com. Hydraulic Press Brick Co., Cham. of	260	de Smet, Geo. W., Cham. of Com. Bldg. Moore, Benjamin & Co., 415 N. Green.	28 228
Com. Bldg. Kimbell, S. S. Brick Co., Cham. of Com. McLaughlin Building Material Co., 9 S.		PAINTS-COLD WATER.	
La Salle St. Moulding, Thomas, Co., Cham. of Com.	$\frac{170}{260}$	Heath & Milligan Mfg. Co., 1833 Seward. Johns-Manville, H. W. Co., 322 N. Michi-	
Wisconsin Lime & Cement Co., Chamber of Commerce 178-		gan Av. Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry Moore, Benjamin & Co., 415 N. Green.	234
MOSAICS. Art Marble Co., 2608 Flournoy St.	238	Muralo Co., The, 355 River St.	228
Marthens, Chester N. Marble Co., 53rd and Wallace Sts.	238	Western Roofing & Sup. Co., Fisher Bldg.	156
Taylor-King Marble Co., 608-618 E. 40th St.	238	PAINTS-DAMP PROOFING.	
MOSAIC—TILE.		Barrett Mfg. Co., 38 S. Dearborn St. Chicago Ironite Water Proofing Co., 118	20
Art Marble Co., 2608 Flournoy St.  MOULDINGS.	238	N. La Salle St. Ill. Damp Proofing Co., 3953 Lowe Av. Ohmlac Mfg. Co., 443 S. Dearborn St. Standard Paint Co., The, 122 S. Michi-	28 36 36
Curtis Door & Sash Co., 2355 Blue Island Av. Mears-Slayton Lumber Co., 1237 Bel-	10	gan Av. Toch Brothers, 133 W. Washington St.	228 28
mont Av. Nollau & Wolff Mfg. Co., 1705 Fuller-	38	PAINT-DAMP RESISTING.	
ton Av. Paine Lumber Co., Otis Bldg.	34	Ceresit Waterproofing Co., Com. Nat. Bank Bldg.	9.9
Inside Back Co	ver	de Smet, Geo. W., Cham, of Com. Bldg. Garden City Sand Co., Cham, of Com.	182
MURAL DECORATIONS.  Brand, Gustave A. & Co., 1428 Michi-		PAINTS—PIREPROOF.	
gan Av. Nelson, W. P., Co., 614 S. Michigan Av.	230 230	Martin-Senour Co., 2520 Quarry Moore, Benjamin & Co., 415 N. Green.	224
Nyden & Thunander, 2960 Michigan Av. Scheuren, Jos. M., 5 N. Wabash Av. Spierling & Linden, 1216 Michigan Av. Sturdy, Joseph F., \$24 S. Michigan Av.	232 230 230 232	Muralo Co., The, 355 River St. Ohmlac Mfg. Co., 443 S. Dearborn St.	30
NURSERY MEN.		PAINT—GRAPHITE.  Heath & Milligan Mfg. Co., 1833 Seward.	226
Wittbold. Geo. Co., The, 737 Bucking- ham Pl.	267	Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry	224
OFFICE BUILDING DIRECTORIES.		Moore, Benjamin & Co., 415 N. Green. Ohmlac Mfg. Co., 443 S. Dearborn St.	30
Tablet & Ticket Co., 624 W. Adams St.	61	Standard Paint Co., The, 122 S. Michigan Av.	228
OFFICE FITTINGS.  Baumann, F. O. Mfg. Co., 1501 Smith Av. Plamondon & Tetze Co., 32 S. Clinton.	38 38	PAINT—IRON. Barrett Mfg. Co., 38 S. Dearborn St.	20
OFFICE FIXTURES.		Ceresit Waterproofing Co., Com. Nat. Bank Bldg.	28
Brunswicke-Balke-Collender Co., 328 S. Wabash Av.	6	Chicago Ironite Water Proofing Co., 118 N. La Salle St.	28
ORNAMENTAL IRON BANK AND OF	F-	Garden City Sand Co., Cham. of Com. Heath & Milligan Mfg. Co., 1833 Seward. Ill. Damp Proofing Co., 3953 Lowe Av.	182 226 30
Chicago Ornamental Iron Co., 37th & Stewart Av. Hanke Iron & Wire Wks., Albany and	196	Moutin Conour Co., 1521 S. Morgan St.	501
Chicago Aves. Heath-Johnson Co., 306 W. Ontario St.	196	Moore, Benjamin & Co., 415 N. Green. Ohmlac Mfg. Co., 443 S. Dearborn St. Standard Paint Co., The, 122 S. Michi-	30
Smith, F. P., W. & I. Wks., 56 W. Lake Standard Co., The, 2420 W. 15th St.	200	gan Av.	228
Winslow Bros. Co., 46th Av. & Harrison ORNAMENTAL PATTERNS FOR MET	196	PAINT MILLS AND MACHINERY. Kaestner & Hecht Co 500 S. Throop St.	24
<b>CA</b> STINGS.			
Dux, Joseph, 2112 W. Van Buren St.	202	PAINTS—MIXED.  Heath & Milligan Mfg. Co., 1833 Seward.	226
ORNAMENTAL TERRA COTTA.  Am. Terra Cotta & Ceramic Co., 122 S. Michigan Av. Midland Terra Cotta Co., Cham. of Com. Northwestern Terra Cotta Co., 80 E. Jackson Blyd. Inside Front Co		Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry Moore, Benjamin & Co., 415 N. Green. Muralo Co., The, 355 River St.  PAINTS—ROOFING.	228
PACKING.		Barrett Mfg. Co., 38 S. Dearborn St.	20
Jenkins Bros., 300 W. Lake St.	206	Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St.	263
PAINTS.	900	Heath & Milligan Mfg. Co., 1833 Seward. Heppes Co., 4505 Fillmore St. Lucas, John & Co., 1521 S. Morgan St.	226
Heath & Milligan Mfg. Co., 1833 Seward, Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry Moore, Benjamin & Co., 415 N. Green, Muralo Co., The, 355 River St.	228 224	Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry Moore, Benjamin & Co., 415 N. Green. Muralo Co., The, 355 River St Ohmlac Mfg. Co., 443 S. Dearborn St.	228 224 228 228

Standard Paint Co., The, 122 S. Michi-	age 228 234	McNulty Bros. Co., Railway Exc. Bldg. <sup>2</sup> Middleton, Edw., 133 W. Washington. <sup>2</sup> States Plastering Co., 30 N. La Salle St. <sup>2</sup>	40 40 42
Western Roofing & Sup. Co., Fisher	156	Sutton, John C. Co., 1st Nat'l Bk. Bldg. 2 Zander-Reum Co., 105 W. Monroe St. 2	42 40
PAINTERS' SUPPLIES.		PLASTERING CONTRACTORS.	
Heath & Milligan Mfg. Co., 1833 Seward. Lucas, John & Co., 1521 S. Morgan St. Martin-Senour Co., 2520 Quarry Muralo Co., The, 355 River St.	226 228 224 228	Dwyer, James J., 9 S. La Salle St. 2 Lennox-Haldeman Co., 79 W. Monroe St. 2 McNulty Bros. Co., Railway Exc. Bldg. 2 Middleton, Edw., 133 W. Washinston. 2	$\frac{40}{40}$
PAINTING CONTRACTORS.  Brand, Gustave A. & Co., 1428 Michigan Av.	230	Sutton, John C. Co., 1st Nat'l Bk. Bldg. 2	42 42 40
Eckart, J. F. Co., 105 S. Dearborn St. Gleich, T. C., 2860 Evanston Av.	262 232	PLASTERING LATH. Northwestern Expanded Metal Co., 37	
McCarthy, E. J. Co., 180 N. Dearborn Nelson, W. P., Co., 614 S. Michigan Av. Noelle, J. B. Co., 179 W. Washington.	262 230 242	W. Van Buren St.	10 242
Nyden & Thunander, 2960 Michigan Av. Scheuren, Jos. M., 5 N. Wabash Av. Spierling & Linden, 1216 Michigan Av.	232 230	PLASTERING MATERIAL. Garden City Sand Co., Cham. of Com. 1	82
Spierling & Linden, 1216 Michigan Av. Sturdy, Joseph F., 824 S. Michigan Av.	232 232	Jenkins & Reynolds Co., Cham. of Com. 2 McLaughlin Building Material Co., 9 S.	60 70
PALMS—ARTIFICIAL.		U.S. Gypsum Co. 205 W. Monoe St.	18
Botanical Decorating Co., 504 S. 5th Av.	32	U. S. Gypsum Co., 205 W. Monoe St. Wisconsin Lime & Cement Co., Chamber of Commerce 178-2	
PAVING CONTRACTORS.		PLASTIC RELIEF.	
Kissack, Wm. 133 W. Washington St.  PHYSICAL LABORATORY.	1	Architectural Dec. Co., 1600 S. Jefferson, 2 Decorators' Sup. Co., 2547 Archer Av.	202 32 202
Am. Bureau of Inspection and Tests,			.02
The, 53 W. Jackson Blvd. Hunt, Robt. W. & Co., 209 S. La Salle.	250 250	PLUMBERS' SUPPLIES.  Mott, J. L., Iron Wks., 104 S. Michigan.	14
PILING.		PLUMBING, GASFITTING AND SEWE	R-
Lake Superior Piling Co., 22nd & Morgan Sts.	46	Am. Heating & Plumbing Corp., 508 S.	220
TITING GONGDIE		Hanrahan, Wm., 807 W. 35th St.	268
PILING—CONCRETE.  Raymond Concrete Pile Co., 111 W.		Lindvall, R. & Co., 1246 W. 59th St.	263 268
Monroe St.	182	Nacey, P. Co., 927 S. State St. 1 Nilson Bros., 3222 N. Halsted St.	156 220
PILING DEALERS.		Noble & Thumm, 2313 Lincoln Av.	$\frac{268}{216}$
Lake Superior Filing Co., 22nd & Morgan Sts.	4.6	PNEUMATIC WATER SYSTEMS.	.10
FILING MANUFACTURERS.		Fairbanks, Morse & Co., 900 S. Wabash, 1	162
Lake Superior Piling Co., 22nd & Mor-			
gan Sts.	46	POWER HOUSE CONSTRUCTION. Baldwin, M. E., Constr. Co., 140 S. Dear-	
PILING-WOOD.		born St.	266
Lake Superior Filing Co., 22nd & Morgan Sts.	46	POWER PLANTS.  Am. Heating & Plumbing Corp., 508 S.	220
PIPE AND BOILER COVERING.		Canal St. Fairbanks, Morse & Co., 900 S. Wabash,	
Cent'l Asbestos & Magnesia Co., 25 W.	0.20	Graves, W. B. Co., 211 N. Jefferson.	210
Kinzie St. Garden City Sand Co., Cham. of Com. Johns-Manville, H. W. Co., 322 N. Michi-	263 182		$\frac{21}{218}$
gan Av. Watson, H. F. Co., 319 Wells St.	234 234	Prentice, L. H. Co., 330 Sherman St., Ranney, Charles D. Co., 5139 N. Clark,	$\frac{212}{216}$
Western Roofing & Sup. Co., Fisher Bldg.	156	Reading, W. D. Heating Co., 39 S. La Salle St. Western Electric Co., 500 S. Clinton St.	268 163
PLASTER.			
Architectural Dec. Co., 1600 S. Jefferson. Decorators' Sup. Co., 2547 Archer Av. Jenkins & Reynolds Co., Cham. of Com.	32	POWER PUMPS.  Am. Steam Pump Co., 310 W. Randolph. Sairbanks, Morse & Co., 900 S. Wabash.	
Plastic Relief Mfg. Co., 949 N. Halsted	202	PREPARED ROOFING MATERIAL.	
PLASTER-ORNAMENTAL.		Barrett Mfg. Co., 38 S. Dearborn St.	20
Architectural Dec. Co., 1600 S. Jefferson.		Cent'l Asbestos & Magnesia Co., 25 W.	
Decorators' Sup. Co., 2547 Archer Av.	202		263
Plastic Relief Mfg. Co., 949 N. Halsted	202 32 202	Heppes Co., 4505 Fillmore St. Standard Paint Co., The, 122 S. Michi-	234
Plastic Relief Mfg. Co., 949 N. Halsted	32	Heppes Co., 4505 Fillmore St. Standard Paint Co., The, 122 S. Michigan Av.	234 228
	32 202 242 242	Heppes Co., 4505 Fillmore St. Standard Paint Co., The, 122 S. Michi- gan Av. Watson, H. F. Co., 319 Wells St. West Coat Co., The, 1732 Michigan Av. Western Roofing & Sup. Co., Fisher	234

PRESSURE HEATING. Page	REGULATORS—HEAT, STEAM, AIR, WATER. Page
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216	Davis, G. M. Regulator Co., 422 Mil-
PUMPS.	waukee Av. 216 Johnson Service Co., 177 N. Dearborn. 214
Am. Steam Pump Co., 310 W. Randolph. 206 Fairbanks, Morse & Co., 900 S. Wabash. 162	Nat'l Regulator Co., 540 W. Harrison. 214 Powers Regulator Co., 1 S. Wabash Av. 214
Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 156	REINFORCED CONCRETE CONSTRUC-
PUMPS—AUTOMATIC AND HYDRAULIC.	Concrete-Steel Products Co., McCor-
Am. Steam Pump Co., 310 W. Randolph. 206	mick Bldg. 176 Corrugated Bar Co., 72 W. Adams St. 4
Fairbanks, Morse & Co., 900 S. Wabash. 162 Kehm Bros. Co., 15 W. Kinzie St. 208	Gabriel Reinforcement Co., Detroit, Mich. 263 Menke-Thielberg Co., 139 N. Clark St. 54
PUMPS—ELECTRIC.	REINFORCING BARS-CONCRETE.
Fairbanks, Morse & Co., 900 S. Wabash. 162	Am. Steel & Wire Co., 72 W. Adams St. 14 Concrete-Steel Products Co., McCor-
PUMPS—SELF-MEASURING.  Bowser, S. F. & Co., 343 S. Dearborn St. and Ft. Wayne, Ind.	mick Bldg. 176 Corrugated Bar Co., 72 W. Adams St. 4 Gabriel Reinforcement Co., Detroit, Mich. 263
PUMFS—VACUUM.	REINFORCING STEEL FABRIC.
Iroquois Engineering Co., 343 S. Dearborn St. 210	Northwestern Expanded Metal Co., 37 W. Van Buren St.
PUMPING MACHINERY.	ROAD BUILDERS.
Am. Steam Pump Co., 310 W. Randolph. 206 Fairbanks, Morse & Co., 900 S. Wabash. 162	Kissack, Wm. 133 W. Washington St. 1
Kehm Bros. Co., 15 W. Kinzie St. 208	ROOF TRUSSES.  McKeown Bros., 4819 Cottage Grove Av. 54
RADIATORS.	ROOFING.
Arcade Steam Heating Co., 118 W. Kinzie St.	Barrett Mfg. Co., 38 S. Dearborn St. 20
Kewanee Boiler Co., 27 W. Lake St. 204-205 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 156	Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St.
Nacey. P. Co., 927 S. State St. 156 Prentice, L. H. Co., 330 Sherman St. 212 Western Valve Co., 188 N. Market St. 263	Johns-Manville, H. W. Co., 322 N. Michigan Av.
	Knisely, Harry C., Co., 1908 S. Western Av. Powell, M. W. Co., 140 S. Dearborn St. 262
RADIATOR SHIELDS.  Mellish-Hayward Co., 158 W. Kinzie, 208	Standard Paint Co., The, 122 S. Michi-
Prentice, L. H. Co., 330 Sherman St. 212	gan Av. Sykes Co., The, 930 W. 19th Pl. Watson, H. F. Co., 319 Wells St.  228 60 234
RAILINGS AND GRILLES—BRASS. Heath-Johnson Co., 306 W. Ontario St. 263	ROOFING-ASBESTOS.
Heath-Johnson Co., 306 W. Ontario St. 263 Standard Co., The, 2420 W. 15th St. 2 Winslow Bros. Co., 46th Av. & Harrison 196	Cent'l Ashestos & Magnesia Co., 25 W. Kinzie St. Johns-Manville. H. W. Co., 322 N. Michi-
REAL ESTATE LOANS.	Watson, H. F. Co., 319 Wells St. 234
Greenebaum Sons Bank & Trust Co., 155 N. Clark St. 220	Western Roofing & Sup. Co., Fisher Bldg.
REFLECTORS—DIRECT AND INDIRECT.	ROOFING—CORRUGATED IRON.  Bremer, H. F., 2229 Ogden Av. 62
Nat'l X-Ray Reflector Co., 235 Jackson Blvd. 30	Knisely, Harry C., Co., 1908 S. Western Av. 60
REFRIGERATING AND ICE MAKING MACHINERY.	Krefting, E., 622 W. Van Buren St. 62 McFarland-Hyde Co., 2701 5th Av. 62 Miller, James A. & Bro., 114 S. Clinton. 62
Kroeschell Bros. Co., 440 W. Erie St. 212 Wolf, Fred W. Co., 827 Rees St.	ROOFING-GENERAL.
Inside front cover	Powell, M. W. Co., 140 S. Dearborn St. 262
REFRIGERATORS.	ROOFING—GRAVEL.  Barrett Mfg. Co., 38 S. Dearborn St. 20
Brunswicke-Balke-Collender Co., 328 S. Wabash Av. Cobb, Whyte & Laemmer Co., 179 N.	Powell, M. W. Co., 140 S. Dearborn St. 262
Clark St. 264 McCray Refrigerator Co., 158 N. Wa-	ROOFING MATERIALS.  Barrett Mfg. Co., 38 S. Dearborn St. 20
bash Av., Chicago & Kendallville, Ind. 12 Orr & Lockett Hardware Co., 14 W.	Garden City Sand Co., Cham. of Com. 182 Heppes Co., 4505 Fillmore St. 234
Randolph St. 30 Wolf, Sayer & Heller, Fulton & Peoria	Johns-Manville, H. W. Co., 322 N. Michi-
Sts. 176 REGULATORS—DAMPER.	Powell, M. W. Co., 140 S. Dearborn St. 262 Watson H. F. Co., 319 Wells St. 234
Davis, G. M. Regulator Co., 422 Milwaukee Av. 216	West Coast Co., The, 1732 Michigan Av. 246 Western Roofing & Sup. Co., Fisher Bldg.

ROOFING NAILS.	RUBBER GOODS. Page Page
Sol-vo Nail & Roofing Supply Co., 1732 Michigan Av.	
michigan Av.	RUBBER HOSE.
ROOFING PAINTS.	20 Allen, W. D. Mfg. Co., 133 W. Lake St. 2
Barrett Mfg. Co., 38 S. Dearborn St. Heath & Milligan Mfg. Co., 1833 Seward.	226 RUBBER TILE.
Johns-Manville, H. W. Co., 322 N. Mich- gan Av.	234 N. Y. Belting & Packing Co., 130 W.
Moore, Benjamin & Co., 415 N. Green.	228 Lake St. 2
Standard Paint Co., The, 122 S. Michigan Av.	228 RUBBER TILING-FLOORS FOR ELE
Watson, H. F. Co., 319 Wells St. West Coast Co., The, 1732 Michigan Av.	234 <b>VATORS AND PUBLIC PLACES.</b> 246 N. Y. Belting & Packing Co., 130 W.
Western Roofing & Sup. Co., Fisher	Lake St. 2
Bldg.	RUGS AND CARPETS— ORIENTAL ANI
Barrett Mfg. Co., 38 S. Dearborn St.	20 DOMESTIC.
Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St.	Carson, Pirie, Scott & Co., Chicago, 23:
Johns-Manville, H. W. Co., 322 N. Michi-	234 SAFES.
gan Av. Standard Paint Co., The, 122 S. Michi-	Fairbanks, Morse & Co., 900 S. Wabash. 163
gan Av. Watson, H. F. Co., 319 Wells St.	228 Harris, S. H. Co., 3323 Grand Av. 1 234
West Coast Co., The, 1732 Michigan Av. Western Roofing & Sup. Co., Fisher	246 SAFES—BANK.
	156 Harris, S. H. Co., 3323 Grand Av. 1:
ROOFING AND SIDING MATERIAL	SAFETY DEPOSIT VAULTS.
West Coast Co., The, 1732 Michigan Av.	Chamber of Commerce Satety vault Co.,
ROOFING—SLAG.	127 W. Washington St 26
Ill. Improvement & Ballast Co., 72 W. Adams St.	188 SAND.
ROOFING SLATE MANUFACTURERS	Am. Sand & Gravel Co., Cham. of Com. Bldg.
MacLellan, H. G. & Co., 25 N. Dearborn	Garden City Sand Co., Cham. of Com. 18:
St.	Wisconsin Lime & Cement Co., Cham-
ROOFING-SLATE AND TILE.	ber of Commerce 178-26
Knisely, Harry C., Co., 1908 S. Western	SAND AND GRAVEL.
MacLellan, H. G. & Co., 25 N. Dearborn	Am. Sand & Gravel Co., Cham. of Com.
St. McFarland-Hyde Co., 2701 5th Av.	62 Garden City Sand Co., Cham. of Com. 18. McLaughlin Building Material Co., 9 S.
Ohmlac Mfg. Co., 443 S. Dearborn St.	La Salle St. 176
ROOFING TIN.	SASH CORD.
Follansbee Bros. Co., 72 W. Adams St. and Pittsburgh, Pa.	60 Samson Cordage Wks., 15 E. Lake St. 26-
	CASH DOORS AND DITTING
ROOFING—TIN, SLATE, TILE AND METAL.	SASH, DOORS AND BLINDS. Curtis Door & Sash Co., 2355 Blue
Bremer, H. F., 2229 Ogden Av. Knisely, Harry C., Co., 1908 S. Western	62 Island Av. 10
Av.	Mears-Slayton Lumber Co., 1237 Bel- mont Av.
Krefting, E., 622 W. Van Buren St. Miller, James A. & Bro., 114 S. Clinton.	Morgan Sash & Door Co., Blue Island 62 Av. and Wood St. Inside Back Cover
ROLLING PARTITIONS.	Nollau & Wolff Mfg. Co., 1705 Fuller- ton Av.
Dodge, H. B. & Co., 332 S. Michigan Av.	Paine Lumber Co Otic Plde
ROLLING PARTITIONS—WOOD AND	D
Dodge, H. B. & Co., 332 S. Michigan Av.	SCALES.  190 Fairbanks, Morse & Co., 900 S. Wabash. 163
Macomber & Whyte Rope Co., 507 S.	SEATS FOR CHURCHES, ASSEMBLY HALLS, THEATERS, SCHOOLS, ETC.
Clinton St.	267 Am. Seating Co., 218 S. Wabash Av. 8
ROPE TRANSMISSION MACHINERY	SEATS AND TANKS.
	244 Tohna Manzilla II IV Cla 202 V Michi
Kaestner & Hecht Co., 500 S. Throop St.	$\frac{-77}{24}$ gan Av. 234
Olson Bros. & Co., 2418 Bloomingdale	244 SECURITY BONDS FOR CONTRACTORS.
Av.	246 246 Ill. Surety Co., 134 S. La Salle St. 64
	Bldg. 64
RUBBER BELTING. Allen, W. D. Mfg. Co., 133 W. Lake St.	U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64
Alien, W. D. Mig. Co., 100 W. Lake St.	20 120 5000 50

SEPARATORS—STEAM AND CIL.	SMOKE STACK LININGS.
Webster, Warren & Co., Monadnock Blk. 214	Page Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St. 263
SEWER PIPE.	
McLaughlin Building Material Co., 9 S. La Salle St. 170	SMOKELESS FURNACES. Kroeschell Bros. Co., 440 W. Erie St. 212
SHADES—WINDOW, FOR RESIDENCES AND STORES.	SOIL AND SOD.
Carson. Pirie, Scott & Co Chicago. 232	Witthold. Geo. Co., The, 737 Bucking- ham Pl. 267
SHEATHING PAPER.	
Barrett Mfg. Co., 38 S. Dearborn St. 20	STABLE FIXTURES—WIRE AND IRON.
Cabot, Samuel, 350 Dearborn Av. 226	Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Hanke Iron & Wire Wks., Albany and
Cent'l Asbestos & Magnesia Co., 25 W. Kinzie St.	Chicago Aves. 198 Heath-Johnson Co., 306 W. Ontario St. 263
Johns-Manville, H. W. Co., 322 N. Michigan Av.	III. Architectural Iron Wks., 139 N.
Standard Paint Co., The, 122 S. Michi-	Mott. J. L., Iron Wks., 104 S. Michigan. 14
Union Fibre Co., Great Northern Bldg. 234	Smith. F. P., W. & I. Wks., 56 W. Lake 200
Watson, H. F. Co., 319 Wells St. 234 Western Roofing & Sup. Co., Fisher	STAIRS AND RAILINGS.
Bldg. 156	Baumann, F. O. Mfg. Co., 1501 Smith Av. 38 Lindquist. A. D. & Co., 1004-16 W.
SHEET CORK-HAIR FELT AND MIN-	North Av. 34
FRAL WOOL INSULATION.  Johns-Manville, H. W. Co., 322 N. Michi-	Plamondon & Tetze Co., 32 S. Clinton. 38
gan Av. 234	STAIR WORK.
SHEET METAL WORKS.	Baumann, F. O. Mfg. Co., 1501 Smith Av. 38 Lindquist, A. D. & Co., 1004-16 W.
Mellish-Hayward Co., 158 W. Kinzie 208	North Av. 34
Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	Plamondon & Tetze Co., 32 S. Clinton. 38
	STAIRS—IRON AND BRONZE.
SHEET METAL WORK FOR BUILDING CONSTRUCTION.	Chicago Ornamental Iron Co., 37th & Stewart Av. 19°
Sykes Co., The, 930 W. 19th Pl. 60	Standard Co., The, 2420 W. 15th St. 2
SHELVES-STEEL FOR FACTORIES.	Western Iron Co., 1809 Belmont Av. 264 Winslow Bros. Co., 46th Av. & Harrison 196
Durand Steel Locker Co., 76 W. Monroe. 263	SHANDADDS
CONTRACT CONTRACTOR	STANDARDS.  Braun, David J. Mfg. Co., The, 668 W.
SEINGLE STAINS. Barrett Mfg. Co., 38 S. Dearborn St. 20	Washington St. 160 Mott, J. L., Iron Wks., 104 S. Michigan, 14
Cabot, Samuel, 350 Dearborn Av. 226	Mott. J. L., from Wes., 194 S. Michigan, 14
Johns-Manville, H. W. Co., 322 N. Michigan Av.	STAND PIPES.
Lucas, John & Co., 1521 S. Morgan St. 228 Moore, Benjamin & Co., 415 N. Green. 228	Cent'l Iron Wks. of Chgo., 939 W. Lake. 194 Hanke Iron & Wire Wks., Albany and
SHOW CASE BARS.	Chicago Aves. 196 Ill. Architectural Iron Wks., 139 X.
Kawneer Mfg. Co., Unity Bldg. and	Clark St. 194
Niles, Mich.	Kroeschell Bros. Co., 440 W. Erie St. 212 Smith. F. P., W. & I. Wks., 56 W. Lake 200
SIDEWALK BUILDERS.	CITA MILA DAL MATIMA I
Blome, R. S. Co., City Hall Square Bldg. 186 Cooper, S. L. & Co., 155 N. Clark St. 265	STATUARY—METAL.  Mott. J. L., Iren Wks., 104 S. Michigan, 14
Cooper, S. L. & Co., 155 N. Clark St. 265 Simpson Constr. Co., Cham. of Com. Bldg. 186	Smith. F P., W. & I. Wks., 56 W. Lake 200
SIDEWALKS—SLAG.	STEAM BOILERS.
Ill. Improvement & Ballast Co., 72 W.	Fairbanks, Morse & Co., 900 S. Wabash, 162
Adams St. 188	Kewanee Boiler Co., 27 W. Lake St. 204-205
SIDEWALK AND VAULT LIGHTS.	STEAM ELEVATORS.
Am, Luxfer Prism Co., 29 E. Madison. 256 Am. 3-Way Prism Co., 3633 S. Ash-	Altizer Elevator Co., 609 La Salle Av. 26 Otis Elevator Co., 600 W. Jackson Bl. 24
land Av. 256	
SKYLIGHTS.	Am. Heating & Plumbing Corp., 508 S.
Bremer, H. F., 2229 Ogden Av. 62 Sykes Co., The, 930 W. 19th Pl. 60	Canal St. 220
Sykes Co., The, 930 W. 19th Pl. 60	Dilzer, Fred, 166 N. Dearborn St. 218 Hanrahan, Wm., 807 W. 35th St. 268
SLATE—INLAID.	Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212
Ohmlac Mfg. Co., 443 S. Dearborn St. 30	Nacey. P. Co., 927 S. State St. 156
SLUICE GATES.	Pope, Wm. A., 26 N. Jefferson St. 268
Jenkins Bros., 300 W. Lake St. 206	Reading, W. D. Heating Co., 39 S. La Salle St. 268

STEAM FITTERS' MATERIAL.	STONE—BRIDGE.
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216	Page Indiana Quarries Co., 112 W. Adams St. 1 McMillan, W. & Son, 910-920 Otis Bldg. 188 Wilde & Schmidt, 21st, W. of Marshall
STEAM GENERATORS.	Blvd. 26_
Kewanee Boiler Co., 27 W. Lake St. 204-205	STONE-BUILDING.
STEAM HEATING APPARATUS.  Am. Heating & Plumbing Corp., 508 S. Canal St. Davis, G. M. Regulator Co., 422 Mil-	Indiana Quarries Co., 112 W. Adams St. 1 McMillan, W. & Son, 910-920 Otis Bldg, 188 Wilde & Schmidt, 21st, W. of Marshall Blvd. 262
waukee Av. Dilzer, Fred, 166 N. Dearborn St. Ehrlich & Co., 136 W. Lake St. General Fire Extinguisher Co., 108 S.	STORE FRONTS.  Kawneer Mfg. Co., Unity Bldg. and Niles, Mich. 6
Graves, W. B. Co., 211 N. Jefferson, 210	STORE AND OFFICE FIXTURES.
Hanrahan, Wm., 807 W. 35th St.  Il. Malleable Iron Co., 1801 Diversey Bl. 210  Iroquois Engineering Co., 343 S. Dearborn St.  210	Brunswicke-Balke-Collender Co., 328 S. Wabash Av. Plamondon & Tetze Co., 32 S. Clinton. 38
Kehm Bros. Co., 15 W. Kinzie St. 208 Kewanee Boiler Co., 27 W. Lake St. 204-205	STRUCTURAL IRON AND STEEL.
Kirk, Geo. H., 6711 Wentworth Av. 218 Kroeschell Bros. Co., 440 W. Erie St. 212 Nacey, P. Co., 927 S. State St. 156 Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	Butler St. Fdry. & Iron Co., 3422 Butler. 198 Holmes. Pyott & Co., 159 N. Jefferson. 194 Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192 Morava Constr. Co., 150 S. Michigan Av. 192 South Halsted St. Iron Wks., 1st Nat'l Bank Bldg.
Nilson Bros., 3222 N. Halsted St. 220 Noble & Thumm, 2313 Lincoln Av. 268 Thillips Catabhay, Co. 120 W. Kingle 212	Smith, F. P., W. & I. Wks., 56 W. Lake 200 Union Fdry, Wks., 1st Nat'l Bk. Bldg. 192
Printips-Geschow Vo., 1987 V. Ranze. 212 Pope, Wm. A., 26 N. Jefferson St. 268 Prentice, L. H. Co., 330 Sherman St. 212 Ranney, Charles D. Co., 5139 N. Clark. 216	SUFFORTS FOR CONCRETE REINFORC-
Salle St. 268	ING BARS. Schultz, Walter L., 29 S. Clinton St. 196
Schampel & Baldwin, 173 W. Washington St.	SURETY BONDS.
Scott Valve Co., 310 W. Randolph St. 206 Thomas & Smith, 116 N. Carpenter St. 216	Ill. Surety Co., 134 S. La Salle St. 64 Maryland Casualty Co., Cham. of Com.
STEAM FOWER BOILERS.	Bldg. 64 Title Guaranty & Surety Co., 209 S. La
Iroquois Engineering Co., 343 S. Dearborn St.	Salle St. U. S. Fidelity & Guaranty Co., 134 S. La Salle St. 64
STEAM PUMPS.	SURVEYORS—CITY AND COUNTY.
Am. Steam Pump Co., 310 W. Randolph. 208 Fairbanks. Morse & Co., 900 S. Wabash. 162	Greeley-Howard Co., 139 N. Clark St. 263 Suhr, B. H. & Co., 139 N. Clark St. 162
STEAM TRAPS.	SURVEYORS' SUPPLIES.
Western Valve Co., 188 N. Market St. 263	Am. Blue Print Paper Co., 335 Plymouth Ct. 264
Am. Steel & Wire Co., 72 W. Adams St. 14	Abbott, A. H. & Co., 127 N. Wabash Av. 262 Dietzgen, Eugene Co., 166 W. Monroe. 264 Keuffel & Esser Co., 68 W. Madison St. 264
Concrete-Steel Products Co., McCormick Bldg. 176 Corrugated Bar Co., 72 W. Adams St. 4	TABLETS AND NAMEPLATES—IRON AND BRONZE.
STEEL FABRIC FOR REINFORCING	Chicago Ornamental Iron Co., 37th & Stewart Av.
Northwestern Expanded Metal Co., 37 W. Van Buren St. 10	Standard Co., The, 2420 W. 15th St. Standard Co., The, 2420 W. 15th St. Winslow Bros. Co., 46th Av. & Harrison 196
STEEL PRESERVATIVE.	TANKS—IRON AND STEEL.
Heath & Milligan Mfg. Co., 1833 Seward. 226 STEEL ROLLING DOORS, SHUTTERS	Kaestner & Hecht Co., 500 S. Throop St. 23 Kewanee Boiler Co., 27 W. Lake St. 204-20 Kroeschell Bros. Co., 440 W. Erie St. 211
AND PARTITIONS.	TANKS-NICKEL PLATERS.
Dodge, H. B. & Co., 332 S. Michigan Av. 190 Hanke Iron & Wire Wks., Albany and Chicago Aves.  196  196  197  198  198  198  198	Alberene Stone Co., 214 N. Clinton St. 263
Kinnear Mfg. Co., 134 S. La Salle St. 190 Smith, F. P., W. & I. Wks., 56 W. Lake 200	TANKS—OIL STORAGE.  Bowser, S. F. & Co., 343 S. Dearborn St. and Ft. Wayne, Ind.
STONE DEALERS—IN ROUGH AND SAWED STONE.	TANK3-UNDERGROUND FOR GAS-
Indiana Quarries Co., 112 W. Adams St. 1 McMillan. W. & Son, 910-920 Otis Bldg. 188 Wilde & Schmidt. 21st, W. of Marshall Blvd. 262	OLINE.  Bowser, S. F. & Co., 343 S. Dearborn St. and Ft. Wayne, Ind.

TAPESTRIES—CURTAINS, ETC.	TREES AND PLANTS.
Carson, Pirie, Scott & Co., Chicago.	Page Botanical Decorating Co., 504 S. 5th Av. 32
TELEPHONES— INTER-COMMUNICATING.	TURN TABLES. Kenwood Bridge Co., 1st Nat. Bk. Bldg. 192
Central Electric Co., 320 S. 5th Av. 164 Western Electric Co., 500 S. Clinton St. 162	UPHOLSTERING. Carson, Pirie, Scott & Co., Chicago. 232
TELEPHONE INSTALLATION. Chicago Telephone Co., 230 W. Wash-	URINAL STALLS
ington St. 166  Ill. Telephone & Telegraph Co., 162 W.	Alberene Stone Co., 214 N. Clinton St. 262
Monroe St. 172	VACUUM CLEANERS FOR OFFICE BUILDINGS, RESIDENCES AND PUBLIC BUILDINGS.
TELEPHONES FOR PRIVATE USE.  Central Electric Co., 320 S. 5th Av. 164	Central Electric Co., 320 S. 5th Av. 164
Western Electric Co., 500 S. Clinton St. 162 TELEPHONES FOR PUBLIC AND PRI-	VACUUM SYSTEM OF HEATING. Iroquois Engineering Co., 343 S. Dear-
VATE USE.	born St. 210 Webster, Warren & Co., Monadnock Blk. 214
Chicago Telephone Co., 230 W. Wash- ington St. 166 Ill. Telephone & Telegraph Co., 162 W.	VALVES.
Monroe St. 172	Chapman Valve Co., 14 N. Franklin St. 208 Jenkins Bros., 300 W. Lake St. 206 Scott Valve Co., 310 W. Randolph St. 206
TEMPERATURE REGULATORS.  111. Malleable Iron Co., 1801 Diversey Bl. 210  Johnson Service Co., 177 N. Dearborn, 214	Western Valve Co., 188 N. Market St. 263
Nat'l Regulator Co., 540 W. Harrison. 214 Powers Regulator Co., 1 S. Wabash Av. 214	VALVES—AIR.  Chapman Valve Co., 14 N. Franklin St. 208 Jenkins Bros., 300 W. Lake St. 206 Scott Valve Co., 310 W. Randolph St. 206
TERRA COTTA.  Am. Terra Cotta & Ceramic Co., 122 S.	VALVES-AIR, CHECK BALANCE.
Michigan Av. 186 Midland Terra Cotta Co., Cham. of Com. 186 Northwestern Terra Cotta Co., 80 E. Jackson Blvd. Inside Front Cover	Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216 Scott Valve Co., 310 W. Randolph St. 206
THERMOSTATS.	VALVES—ALL KINDS. Chapman Valve Co., 14 N. Franklin St. 208
Johnson Service Co., 177 N. Dearborn. 214 Nat'l Regulator Co., 540 W. Harrison. 214 Powers Regulator Co., 1 S. Wabash Av. 214	Jenkins Bros., 300 W. Lake St. 206 Scott Valve Co., 310 W. Randolph St. 206
TILE—FLOORS.	VALVES—BACK PRESSURE. Davis, G. M. Regulator Co., 422 Mil-
Art Marble Co., 2608 Flournoy St. 238 Marthens. Chester N. Marble Co., 53rd and Wallace Sts. Taylor-King Marble Co., 608-618 E. 40th	waukee Av. 216 Jenkins Bros., 300 W. Lake St. 206 Scott Valve Co., 310 W. Randolph St. 206
St. 238	VALVES-BLOW-OFF.
Art Marble Co., 2608 Flournoy St. 238	Scott Valve Co., 310 W. Randolph St. 206
Marthens, Chester N. Marble Co., 53rd and Wallace Sts. 238 Taylor-King Marble Co., 608-618 E. 40th	VALVE MANUFACTURERS. Chapman Valve Co., 14 N. Franklin St. 208
St. 238	Davis, G. M. Regulator Co., 422 Milwaukee Av. 216 Jenkins Bros., 300 W. Lake St. 206
N. Y. Belting & Packing Co., 130 W.	Scott Valve Co., 310 W. Randolph St. 206
Lake St. 26	VALVES—PACKLESS RADIATOR.  Iroquois Engineering Co., 343 S. Dear-
Art Marble Co., 2608 Flournoy St. 238 Marthens, Chester N. Marble Co., 53rd	born St. 210
and Wallace Sts.  Taylor-King Marble Co., 608-618 E. 40th St.  238	VALVES—POP. Scott Valve Co., 310 W. Randolph St. 206
TIN AND TIN PLATE.	VALVES—PRESSURE REDUCING. Jenkins Bros., 300 W. Lake St. 206
Follansbee Bros. Co., 72 W. Adams St. and Pittsburgh, Pa. 60	Scott Valve Co., 310 W. Randolph St. 206
TIN AND TERNE PLATES.	VALVES—RADIATOR.  Iroquois Engineering Co., 343 S. Dear-
Follansbee Bros. Co., 72 W. Adams St. and Pittsburgh, Pa. 60	born St. 210  VALVES—REGULATING.
TRAPS—STEAM.  Davis, G. M. Regulator Co., 422 Mil-	Davis, G. M. Regulator Co., 422 Milwaukee Av. 216
waukee Av. 216	Scott Valve Co., 310 W. Randolph St. 206

VALVES-RELIEF.	WALL DECORATIONS.
Page	Brand, Gustave A. & Co., 1428 Michi-
Davis, G. M. Regulator Co., 422 Mil- waukee Av. 216	gan Av. 230
Scott Valve Co., 310 W. Randolph St. 206	Carson, Pirie, Scott & Co., Chicago. 232 Gleich, T. C., 2860 Evanston Av. 232
TATTE TACILLY	Nelson, W. P., Co., 614 S. Michigan Av. 230
Chapman Valve Co., 14 N. Franklin St. 208	Nyden & Thunander, 2960 Michigan Av. 232 Spierling & Linden, 1216 Michigan Av. 230
Davis, G. M. Regulator Co., 422 Mil-	Sturdy, Joseph F., 824 S. Michigan Av. 232
waukee Av. 216	
Scott Valve Co., 310 W. Randolph St. 206 Webster, Warren & Co., Monadnock Blk. 214	WALL FINISH AND DECORATIONS.  Moore, Benjamin & Co., 415 N. Green. 228
•	Moore, Benjamin & Co., 115 1v. Green. 225
VARNISHES.	WALL FINISH—INTERIOR.
Berry Brothers, Ltd., 59 E. Lake St. 226 Chicago Varnish Co., 2100 Elston Av. 224	Heath & Milligan Mfg. Co., 1833 Seward. 226
Heath & Milligan Mfg. Co., 1883 Seward, 225	WALL PAPER.
Moore, Benjamin & Co., 415 N. Green. 228 Murphy Varnish Co., 42 W. 22nd St. 226	Brand, Gustave A. & Co., 1428 Michi-
Standard Varnish Wks., 2620 Armour Av.	gan Av. 230
	Carson, Pirie, Scott & Co., Chicago. 232 Eckart, J. F. Co., 105 S. Dearborn St. 262
VAULTS-BANK.	Gleich, T. C., 2860 Evanston Av. 232
Harris, S. H. Co., 3323 Grand Av. 12	McCarthy, E. J. Co., 180 N. Dearborn 262 Nelson, W. P., Co., 614 S. Michigan Av. 230
	Noelle, J. B. Co., 179 W. Washington, 242
VAULT DOORS.	Nyden & Thunander, 2960 Michigan Av. 232 Scheuren, Jos. M., 5 N. Wabash Av. 230
Harris, S. H. Co., 3323 Grand Av. 12	Spierling & Linden, 1216 Michigan Av. 230
VENETIAN BLINDS.	Sturdy, Joseph F., 824 S. Michigan Av. 232
Dodge, H. B. & Co., 332 S. Michigan Av. 190	WALL PLASTER.
Dodge, II. D. & Co., box S. Mionigan 114, 200	Garden City Sand Co., Cham. of Com. 182
VENTILATORS.	U. S. Gypsum Co., 205 W. Monoe St. 18- Wisconsin Lime & Cement Co., Cham-
Follansbee Bros. Co., 72 W. Adams St.	ber of Commerce 178-260
and Pittsburgh, Pa. 60 Kernchen Co., 332 S. Michigan Av. 32	
Mellish-Hayward Co., 158 W. Kinzie 208	WALL PLUGS.
Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	Kawneer Mfg. Co., Unity Bldg. and Niles, Mich.
Packer, Alfred A. Co., 38 S. Dearborn St. 22	Titles, Michigan
	WARDROBES-STEEL.
VENTILATING APPARATUS.	Durand Steel Locker Co., 76 W. Monroe. 263
Am. Heating & Plumbing Corp., 508 S. Canal St. 229	WARDROBES-VENTILATED.
Commonwealth Edison Co., 120 W.	Dodge, H. B. & Co., 332 S. Michigan Av. 196
Adams St. 168 Ehrlich & Co., 136 W. Lake St. 218	***************************************
Graves, W. B. Co., 211 N. Jefferson. 210	WASHING MACHINES—ELECTRIC.
Hanrahan, Wm., 807 W. 35th St. 268 Kehm Bros. Co., 15 W. Kinzie St. 208	Central Electric Co., 320 S. 5th Av. 164
Kernchen Co., 332 S. Michigan Av. 32	WATER FILTERS AND WATER SUPPLY
Kilander, A. & Co., 126 S. Clinton St. 268 Kirk, Geo. H., 6711 Wentworth Av. 218	SYSTEM.
Mehring & Hanson Co., 307 W. Wash-	Nacey, P. Co., 927 S. State St. 156
ington 212 Mellish-Hayward Co., 158 W. Kinzie 208	WATER HEATERS.
Nacey, P. Co., 927 S. State St. 156	Bastian-Morley Co., 64 W. Randolph St. 176
Narowetz Heating & Ventilating Co., 223 W. Lake St. 208	Kewanee Boiler Co., 27 W. Lake St. 204-205
Facker, Alfred A. Co., 38 S. Dearborn St. 22	WATER AND STEAM BOILERS.
Phillips-Getschow Co., 130 W. Kinzie. 212 Prentice, L. H. Co., 330 Sherman St. 212	Arcade Steam Heating Co., 118 W. Kin-
Ranney, Charles D. Co., 5139 N. Clark. 216	zie St. 268
Thomas & Smith, 116 N. Carpenter St. 216	WATER SUPPLY SYSTEMS.
Webster, Warren & Co., Monadnock Blk. 214 Western Electric Co., 500 S. Clinton St. 162	Fairbanks, Morse & Co., 900 S. Wabash. 162
VENTILATING FANS.	WATERPROOFING.
Central Electric Co., 320 S. 5th Av. 164	Ceresit Waterproofing Co., Com. Nat.
Fairbanks, Morse & Co., 900 S. Wabash, 162	Bank Bldg. 28
Western Electric Co., 500 S. Clinton St. 162	Chicago Ironite Water Proofing Co., 118 N. La Salle St. 28
WALL BOARD.	de Smet, Geo. W., Cham. of Com. Bldg. 28
Heppes Co., 4505 Fillmore St. 234	Ill. Damp Proofing Co., 3953 Lowe Av. 39 Standard Paint Co., The, 122 S. Michi-
	gan Av. 228
WALL COPING.	WATER PROOFING CEMENT.
Garden City Sand Co., Cham, of Com. 182 Hydraulic Press Brick Co., Cham, of	Standard Paint Co., The, 122 S. Michi-
Com. Bldg. 260	gan Av. 228
Lowry, Albert J., Cham. of Com. Bldg. 170 McLaughlin Building Material Co., 9 S.	WEATHER STRIPS.
La Salle St. 170	Chicago Metal Weather Strip Co., 1617
Northwestern Terra Cotta Co., 80 E. Jackson Blvd. Inside Front Cover	N. Troy St. Robbins Mfg. Co., Monadnock Blk.

WEATHER STRIPS—METAL.	ıge	WIRELESS CLUSTERS—STANDARD AND SEPARABLE.
Chicago Metal Weather Strip Co., 1617		Page
N. Troy St. Robbins Mfg. Co., Monadnock Blk.	164 164	Benjamin Electric Mfg. Co., 120 S. Sangamon St. 160 Western Electric Co., 500 S. Clinton St. 162
WINDOW GUARDS.		Western Electric Co., 500 S. Chillon St. 102
Western Iron Co., 1809 Belmont Av.	264	WIRE WORK.
WINDOWS-MEMORIAL		Division Iron Wks., 1317 W. Division St. 266
		Hanke Iron & Wire Wks., Albany and Chicago Aves. 196
Flanagan & Biedenweg Co., 312 W. Illinois St.	258	Heath-Johnson Co., 306 W. Ontario St. 263
WINDOW AND DOOR SCREENS		Smith. F. P., W. & I. Wks., 56 W. Lake 200 Standard Co., The, 2420 W. 15th St. 2
Robbins Mfg. Co., Monadnock Blk.	164	
Robbins Mig. Co., Monadhock Bik.	101	WOOD CARVING.
WINDOWS-WIRE GLASS.		Architectural Dec. Co., 1600 S. Jefferson, 202
McFarland-Hyde Co., 2701 5th Av.	62	Decorators' Sup. Co., 2547 Archer Av. 32 Dux, Joseph, 2112 W. Van Buren St. 202
Mississippi Wire Glass Co., 7 W. Madi-	256	Plastic Relief Mfg. Co., 949 N. Halsted 202
son St. Voigtmann & Co., 445 W. Erie St.	60	
Tong Children		WOOD COLUMNS.
WINDMILLS.		Hartmann-Sanders Co., 2155 Elston Av. 38
Fairbanks, Morse & Co., 900 S. Wabash.	162	Morgan Sash & Door Co., Blue Island Av. and Wood St. Inside Back Cover
WIRE FABRIC FOR CONCRETE FI	RE.	
PROOFING.		WOOD FINISHING.
Am. Steel & Wire Co., 72 W. Adams St.	14	Gleich, T. C., 2860 Evanston Av. 232
WIRE GLASS.		
Mississippi Wire Glass Co., 7 W. Madi-		WOOD PILES.
son St.	256	Lake Superior Filing Co., 22nd & Morgan Sts. 46
Voigtmann & Co., 445 W. Erie St.	60	gan sts.
WIRE GUARDS AND SCREENS.		WOOD TURNING.
Hanke Iron & Wire Wks., Albany and		Hartmann-Sanders Co., 2155 Elston Av. 38
Chicago Aves. Standard Co., The, 2420 W. 15th St.	196	
Standard Co., The, 2420 W. 15th St.	-	WOVEN WIRE CONCRETE REINFORCE- MENTS.
WIRE—RUBBER INSULATED		
Central Electric Co., 320 S. 5th Av.	164	Am. Steel & Wire Co., 72 W. Adams St. 14
WIRE SASH AND FRAMES-GLAZE	ED.	WRECKING, EXCAVATING, FILLING
McFarland-Hyde Co., 2701 5th Av.	6.2	AND SODDING.
Voigtmann & Co., 445 W. Erie St.	60	Newman, W. J. Co., 19 N. Curtis St. 58

The foregoing Classified List of Advertisers contains nearly everything required in the construction of buildings. The firms whose names appear are well known to Architects and Builders. The compact and complete form in which it appears make it a very useful list of material firms and contractors for the architect when sending for figures and writing specifications.

# INDEX TO ADVERTISERS.

A I	Page	C	Page
Abbott, A. H. & Co	$\frac{262}{26}$	Cabot, Samuel	
Allerton-Clarke Co	26	Carson, C. E. Co	232
American Blue Print Paper Co  American Bureau of Inspection & Tests, The	264 250	Central Electric Company Central Iron Works of Chicago	$\frac{164}{194}$
American Heating & Plumbing Corporation	220	Chamber of Commerce Safety Vaults	
American Laundry Machinery Co., The	236	Chaney-Archibald Co	
American Luxfer Prism Company  American Sand & Gravel Co  American Scatting Company	256 178 8	Chicago Face Brick Association266 Chicago Ironite Waterproofing Co	
American Seating Company  American Steam Pump Co  American Steel and Wire Co	$\frac{3}{206}$	Chicago Metal Weather Strip Co Chicago Ornamental Iron Co	
American Terra Cotta & Ceramic	186	Chicago Portland Cement Co	
American 3-Way Prism Co	$\frac{256}{48}$	Clark, C. Everett Company	46
Appel, Henry & Son Co	48 268	Cobb, Whyte & Laemmer Co  Commonwealth Edison Company  Concrete-Steel Products Co	
Architectural Decorating Co  Art Marble Company  Atlas Portland Cement Co., The	202 $238$ $182$	Cook, Wm. G. Company	236
,,,,,,,,,,		Corn Exchange National Bank, The	22
В		Corrugated Bar Company	4
Baldwin M. E. Construction Co	266	Corrugated Bar Company	$\frac{160}{264}$
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co	$\frac{242}{20}$	Corrugated Bar Company Crockett, William P. Company Crofoot, Nielsen & Co Cullen, Geo. P Curtis Brick Co	$160 \\ 264 \\ 265 \\ 267$
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co	$242 \\ 20 \\ 176 \\ 38$	Corrugated Bar Company Crockett, William P. Company Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co	$160 \\ 264 \\ 265$
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co	242 $20$ $176$ $38$ $160$	Corrugated Bar Company Crockett, William P. Company Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co  D Dahlstrom Metallic Door Company	$160 \\ 264 \\ 265 \\ 267$
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company Bergendahl-Bass Engineering & Construction Co.	242 $20$ $176$ $38$ $160$ $160$	Corrugated Bar Company Crockett, William P. Company Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co D	160 264 265 267 10
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company Bergendahl-Bass Engineering & Construction Co. Berry Brothers, Ltd. Black, James, Masonry & Contract-	242 20 176 38 160 160 44 200 226	Corrugated Bar Company	160 264 265 267 10 16 216 32 28 264 218
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company Bergendahl-Bass Engineering & Construction Co Berry Brothers, Ltd. Black, James, Masonry & Contracting Co Blome, R. S. Co	242 20 176 38 160 160 44 200 226	Corrugated Bar Company. Crockett, William P. Company. Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co  D Dahlstrom Metallic Door Company. Davis, G. M. Regulator Co Decorators' Supply Co. de Smet, George W Dietzgen, Eugene Co Dilzer, Fred Division Iron Works. Dodge, H. B. & Co	160 264 265 267 10 16 216 32 28 264 218 266 190
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company. Bergendahl-Bass Engineering & Construction Co. Berry Brothers, Ltd. Black, James, Masonry & Contracting Co. Blome, R. S. Co Bonner & Marshall Co Botanical Decorating Co., The	242 20 176 38 160 160 44 200 226 42 186 260 32	Corrugated Bar Company. Crockett, William P. Company. Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co  Dahlstrom Metallic Door Company. Davis, G. M. Regulator Co Decorators' Supply Co. de Smet, George W Dietzgen, Eugene Co Dilzer, Fred Division Iron Works. Dodge, H. B. & Co Doherty, Frank E Dowling & Rutherford.	160 264 265 267 10 16 216 32 28 264 218 266 190 267 267
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company Bergendahl-Bass Engineering & Construction Co. Berry Brothers, Ltd. Black, James, Masonry & Contracting Co. Blome, R. S. Co Bonner & Marshall Co Botanical Decorating Co., The Bowser, S. F. & Co Brand, Gustave A. & Co Braun, David J. Mfg. Co., The	242 20 176 38 160 160 44 200 226 42 186 260 32 4 230	Corrugated Bar Company. Crockett, William P. Company. Crofoot, Nielsen & Co. Cullen, Geo. P. Curtis Brick Co. Curtis Door & Sash Co.  Dahlstrom Metallic Door Company. Davis, G. M. Regulator Co. Decorators' Supply Co. de Smet, George W. Dietzgen, Eugene Co. Dilzer, Fred Division Iron Works. Dodge, H. B. & Co. Doherty, Frank E. Dowling & Rutherford. Durand Steel Locker Co. Dux, Joseph	$\begin{array}{c} 160 \\ 264 \\ 265 \\ 267 \\ 10 \\ \\ \end{array}$
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Bent, E. M. Company. Bergendahl-Bass Engineering & Construction Co Berry Brothers, Ltd. Black, James, Masonry & Contracting Co. Blome, R. S. Co Bonner & Marshall Co. Botanical Decorating Co., The Bowser, S. F. & Co Brand, Gustave A. & Co Braun, David J. Mfg. Co., The Bremer, H. F Brown, Wm. H. & Co	242 20 176 38 160 44 200 226 42 186 260 32 4 230 160 62 58	Corrugated Bar Company. Crockett, William P. Company. Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co  D Dahlstrom Metallic Door Company. Davis, G. M. Regulator Co Decorators' Supply Co. de Smet, George W Dietzgen, Eugene Co Dilzer, Fred Division Iron Works. Dodge, H. B. & Co Doherty, Frank E. Dowling & Rutherford. Durand Steel Locker Co Dux, Joseph Dwyer, James J  E	160 264 265 267 10 16 216 32 28 264 218 266 190 267 267 263 2242
Baldwin M. E. Construction Co Balhatchel, William Co Barrett Manufacturing Co Bastian-Morley Company Baumann, F. O. Mfg. Co Beaver Electric Construction Co Benjamin Electric Mfg. Co Benjamin Electric Mfg. Co Bent, E. M. Company Bergendahl-Bass Engineering & Construction Co. Berry Brothers, Ltd. Black, James, Masonry & Contracting Co. Blome, R. S. Co Bonner & Marshall Co Botanical Decorating Co., The Bowser, S. F. & Co Brand, Gustave A. & Co Braun, David J. Mfg. Co., The Bremer, H. F	242 20 176 38 160 44 200 226 42 186 260 32 4 230 160 62	Corrugated Bar Company. Crockett, William P. Company. Crofoot, Nielsen & Co Cullen, Geo. P. Curtis Brick Co Curtis Door & Sash Co  D D Dahlstrom Metallic Door Company. Davis, G. M. Regulator Co Decorators' Supply Co. de Smet, George W Dietzgen, Eugene Co Dilzer, Fred Division Iron Works. Dodge, H. B. & Co Doherty, Frank E. Dowling & Rutherford. Durand Steel Locker Co Dux, Joseph Dwyer, James J	$\begin{array}{c} 160 \\ 264 \\ 265 \\ 267 \\ 10 \\ \\ \end{array}$

e ,	2000	, Dam
Fairbanks, Morse & Co Falkenau Construction Co Flanagan & Biedenweg Follansbee Brothers Co Foundation Company, The Freeman-Sweet Company Friestedt, L. P. Co Fuller, George A. Co	$\frac{60}{52}$	Page   Page
G		Knisely, Harry C. Co.       60         Kohler Brothers       158         Krefting, E.       62
Gabriel Reinforcement Co	182	Kroeschell Bros. Co
Glannini & Hilgart Gilsdorff Brothers Co. Gindele, Charles W. Co. Gleich, T. C. Graves, W. B. Co. Greeley-Howard .Co. Greenebaum Sons Bank & Trust Company Griffiths, John & Son Co.	253 266 46 232 210 263	Lake Superior Piling Company.       46         Lally Column Company.       200         Lanquist & Illsley Company.       44         Lennox-Haldeman Co.       240         Leonard Construction Company       48         Lewis & Kitchen       210         Lindquist, A. D. & Co.       34         Lindvall, R. & Co.       263         Link-Belt Company       244         Lowry, Albert J.       170         Lucas, John & Co.       228
Halsted, Joseph Co	192	Lund, Abraham Company 48
Hanke Iron & Wire Works.  Hanrahan, Wm.  Harris, S. H. Company, The.  Hartmann-Sanders Co  Heath-Johnson Co  Heath & Milligan Mfg. Co  Hendry, Alexander  Heppes Company, The  Hinchliff, Geo. Co., The  Holmes, Pyott & Co  Hunt, Robert W. & Co  Hydraulic-Press Brick Co  I  Illinois Architectural Iron Works.  Illinois Composition Floor Co	196 268 12 38 263 226 266 234 52 194 250 260	M           Macomber & Whyte Rope Co.         267           MacLellan, H. G. & Co.         262           Marquette Cement Mfg. Co.         184           Marthens, Chester N. Marble Co.         238           Martin Construction Co.         266           Martin-Senour Co., The.         224           Maryland Casualty Company.         64           Mavor, William Co.         50           McCarthy, E. J. Company.         262           McCray Refrigerator Company.         12           McFarland Hyde Company.         62           McKeown Brothers.         54           McLaughlin Building Material Co.         170           McMillan, W. & Son.         188           McNulty Bros. Company.         240           Meacham & Wright Company.         184
Illinois Damp Proofing Co., The Illinois Improvement & Ballast Company Illinois Malleable Iron Co		Mears-Slayton Lumber Co38Mehring & Hanson Company.212Meiling & Company.265Mellish-Hayward Company.208
Illinois Surety Company Illinois Telephone & Telegraph Co Illinois Terra Cotta Lumber Company, The	$64 \\ 172 \\ 180$	Menke-Thielberg Co
Indiana Quarries Co		Miller, James A. & Bro
J Jeffrey Mfg. Co. Jenkins Bros. Jenkins & Reynolds Co. Johns-Manville H. W. Co. Johnson Service Company. Joor Engineering Company.  K	206 260 234 214 244	Moore, Benjamin & Company.         228           Morava Construction Co.         192           Morey, Newgard & Co.         250           Morgan Sash and Door Co, The.         Inside Back Cover           Morrice & Barron         265           Mott, J. L. Iron Works         14           Moulding, Thomas Co.         260           Muller, Franklyn R. & Company.         222           Muralo Company, The         228
Kaestner & Hecht Co	208	Murphy-Keeley Co.       268         Murphy Varnish Company       226         Muth, Chr. Mfg. Co., The       190         Nacey, P. Co.       156

N. Para	D
No Page	Page Smith, F. P. Wire & Iron Works 200
Narowetz Heating & Ventilating Company	Snyder, J. W. Co
pany	Sollitt, Ralph & Sumner Co 52
National Fire Proofing Company 180	South Halsted Street Iron Wks 194
National Regulator Co	Sol-Vo Nail & Roofing Supply Co 246
National X-Ray Reflector Co 30	Spierling & Linden
Nelson, W. P. Company 230	Standard Co., The 2
Newgard, Henry & Co	Standard Paint Co., The 228
Newman, W. J. Co	Standard Varnish Works 222
New York Belting & Packing Co 26	States Plastering Co., The 242
Nicholson, Zimmerman & Co 50 Nilson Brothers	Stein, Carl John         216           Stewart, James & Co.         40
Noble & Thumm	Strandberg, E. P. Co
Noelle, J. B. Co	Stressenreuter Brothers 265
Nollan & Wolff Mfg. Co., The 34	Strobel Steel Construction Co 198
North Branch Flooring Co 267	Sturdy, Joseph F
North-Western Expanded Metal Co 10	Suhr, B. H. & Co 162
Northwestern Terra Cotta Co., The	Sutton, John C. Company 242
Inside Front Cover	Sykes Company, The 60
Nyden & Thunander	Т
0	Tablet & Ticket Co., The 64
Ohmlac Mfg. Co 30	Taylor-King Marble Co
Olson, A. & J 266	Thomas & Smith
Olson Brothers 44	Thompson-Starrett Company 42
Olson Brothers & Company 246	Title Guaranty & Surety Co 262
Olson & Brockhausen Co 56	Toch Brothers
Orr & Lockett Hardware Co 30 Otis Elevator Company 24	Todd, James & Co
	Troy Laundry Machinery Co 236
P	U
Packer, Alfred A. Co	Union Fibre Company
Paine Lumber CoInside Back Cover Paschen Brothers 54	Union Foundry Works
Peerless Portland Cement Co 184	United States Fidelity & Guaranty Co. 64 United States Gypsum Co
Peoples Gas Light & Coke Co., The 174	Universal Portland Cement Co 178
Phillips, Getschow Co	
Pillinger, W. A. Company 54	V
Plamondon & Tetze Co	Variety Manufacturing Co
Plastic Relief Mfg. Co., The 202	Voigtmann & Company
Powell, W. M. Co	Voss, Frederick
Powers Regulator Company, The 214	· ·
Pope, William A.         268           Prentice, L. H. Company         212	Woodeford Floatrie Co. 169
Purdy & Henderson 248	Wadeford Electric Co
	Watson, H. F. Co
Ranney, Chas. D. Co., The 216	Webster, Warren & Co
Raymond Concrete Pile Company 182	Weller Mfg. Co 246
Reading, W. D. Heating Co 268	Wells Brothers Company 40
Reder Foundry Co	West Coast Company, The 246
Regnell, B. J. Co	Westcott & Ronneberg
Rittenhouse & Embree Co 34	Western Electric Company 162
Robbins Manufacturing Company 164	Western Roofing & Supply Company 156
Robinson Furnace Co	Western Roofing & Supply Company 156 Western Valve Co 263
Rodatz, Jacob	White City Electric Company 158
Ross, R. J. Manufacturing Co 198	Wilce, T. Co., The
S S	Wilde & Schmidt
Samson Cordage Works 264	Winslow Bros. Company, The 196
Schampel & Baldwin	Wisconsin Line & Cement Co178-260
Scharmer, Jacob Co.         44           Scheuren, Joseph M.         230	Wittbold, Geo. Co
Schneider & Trenkamp Co 174	Wolf, Fred W. CoInside Front Cover Wolf, Sayer & Heller
Schuler Art Glass Co	Woodbury Granite Company 188
Schultz, Walter L	Woodman, Andrew W
Scott Valve Company 206	
Shankland, E. C. & R. M	Yellow Pine Manufacturers' Assn 36
Shedden, James & Co 50	
Sheeler & Son Co	Z
Simpson Construction Co 186	Zander-Reum Co 240

# TABLE OF CONTENTS.

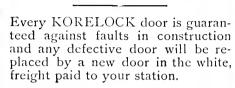
Address, maugural, of Argyle E. Robinson, President Chicago Architects' Busi-	
ness Association	231
Advertisers, Classified List of	333
Announcement	9
Building Ordinance of the City of Chicago (See Index, Page 319)	65
Canons of Professional Ethics of the Chicago Architects' Business Association.	21
Cement and Steel Structural Materials, Specifications Therefor	191
Cement, Standard Specifications for	235
Chicago Architects' Business Association, Officers and Members, List of	49
Chicago Architectural Club, Officers and Members, List of	53
Chicago Ventilation Committee, The, List of Resolutions	219
City Hall and County Building Information and Guide	61
City Officials and Chiefs of Various Departments	59
Classified List of Advertisers	333
	999
Committee on Public Action of the Chicago Architects' Business Association,	1-
Engraving of	15
Concrete and Excavation Work, Rules and Measurement for	185
Conveying Machinery, by S. F. Joor, M. E.	243
Directors of the Chicago Architects' Business Association, Engraving of	13
Editorial of the Chicago Architects' Business Association	19
Electrical Ordinance and Matter Pertaining to Same	159
Excavation and Concrete Work, Rules and Measurement for	185
Gasfitters' Rules for Piping Buildings	175
Glass and Glazing	257
Heating and Ventilating, Hints and Formula on Same, Edited by Fred J. Postel,	
Mech. Eng.	207
Hollow Tile Fireproofing, Standard Specifications for	181
Illinois Chapter American Institute of Architects, Officers and Members, List of.	57
Index to Building Ordinance (See Ordinance on Pages 65-155)	319
Index to Miscellaneous and Useful Information	317
Licensed Architects, List of	31
Map Showing Fire Limits Boundary Lines of the City of Chicago	157
Materials, Strength of	237
Miscellaneous and Useful Information	
Officers and Committees of the Chicago Architects' Business Association	5
Officers of the Chicago Architects' Business Association, Engraving of	11
Plastering, Standard Rules of the Measurement of	241
Preface	7
Regulations Governing Commonwealth-Edison Co.'s System	169
Report of First Inspection of The Tennessee Fence, by Henry A. Gardner	225
Schedule of Proper Minimum Charges and Professional Practice of Architects	229
Recommended by the Chicago Architects' Business Association	27
Small T Beams, Functions of	239
State Board of Examiners of Architects, Engraving of	17
Strength of Materials	237
	201
Structural Materials—Cement and Steel, and Specifications Therefor, by Robert	191
W. Hunt	191
Structural Steel for Buildings, General Specifications for, by Robert W. Hunt,	197
Eng.	197
Subject Index, System of Classification for Filing Drawings, Plates and Cata-	911
logues in Architects' and Contractors' Offices	311
Title Page	3
Useful Information Concerning Building, Engineering Trades and Materials	269
Varnish, Points on	223
Wiring and Cabling of Buildings for Service of the Chicago Telephone Co., Sug-	4.0-
gestions for the Provisions of	165
Wiring and Cabling of Buildings for Service of the Illinois Telephone and Tele-	
graph Company, Suggestions for the Provisions of	173
Wiring Specifications, Suggestions on, by Fred J. Postel, Consulting Engr	254

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Can it be that all
Two centuries bring
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